THE HEATING AND VENTILATING MAGAZINE

1123 BROADWAY NEW YORK APRIL, 1907

Heating and Ventilation of the Royal Alexandra Theatre, Toronto, Canada

Use of Upward System of Ventilation in a Cold Climate

One of the arguments that are sometimes heard against the use of an upward system of ventilation is the large proportion of wasted heat that escapes with the vitiated air. This argument would seem to have special weight in a climate as cold as that of Canada. The heating and ventilating system, therefore, which has been laid out for the Royal Alexandra Theatre, at Toronto, in which the ventilation is upward has some features of special interest.

As in the case of a number of theatres that have been equipped in American cities lately, some of which have been illustrated in these columns, the entire space beneath both orchestra and stage is given up to a plenum chamber, receiving a constant supply of fresh warmed and washed air which reaches the occupants of the theatre through scores of "mushroom" inlets located directly beneath the orchestra chairs.

The heating system is supplied with two of the largest size cast iron sectional boilers made by the Gurney Foundry Co., of Toronto. Each boiler has a total heating surface of 6,000 square feet. The boilers are cross-connected and arranged so that either one or both may be run at the same time to do the same work. They are connected by heavy iron breeching, made of No. 16 black iron, to an upright iron stack.

The steam and return pipes are arranged for low pressure gravity return, with the returns below the water line. A separate system of steam and return mains connects with the indirect heating coils, with valves at the boiler.

The rising lines supplying the direct radiators throughout the administration and theatre parts of the building are two-pipe. The risers in the dressing rooms at the rear of the theatre are one-pipe, with a complete system of air mains, with automatic drip air valves for all direct and indirect radiators.

Included in the heating apparatus are a number of coils, placed in the main stage skylight and in other skylights in the administration building. Trenches with cast iron covers for the return main are located in the basement floor, as will be seen from the illustration.

The steam and return mains in the basement except in the plenum chamber, together with the risers and radiator connections under floors are covered with 1-inch air cell non-conducting covering.

VENTILATING APPARATUS

The entire auditorium and parts of the main vestibule are heated by indirect radiation. The air is taken in through a duct on the roof of the administration wing about 12 feet above the sidewalk level and enters the settling or washing chamber, whence it passes through water sprays and eliminators.

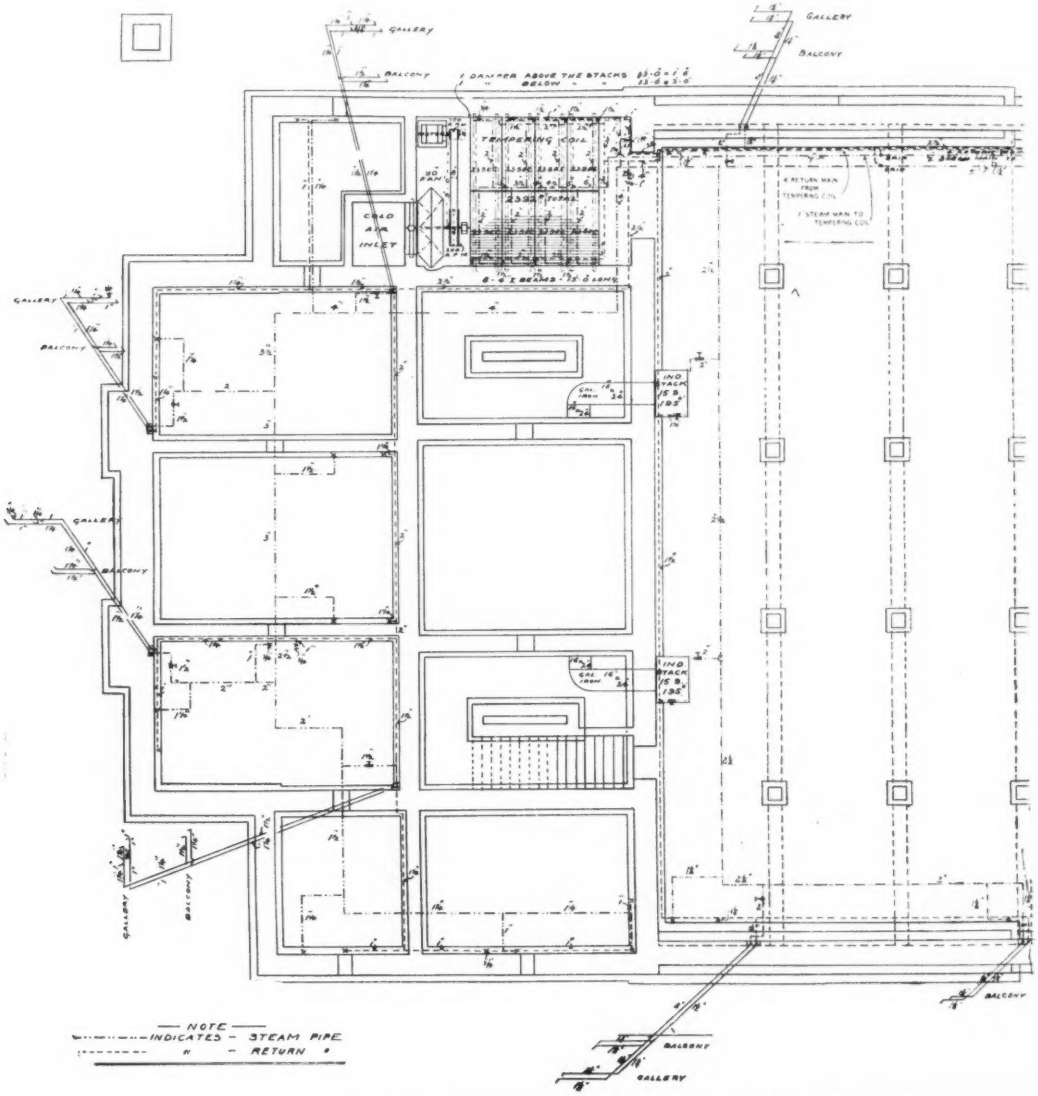
This apparatus is located at the base of the intake shaft. A water pan 5x8 feet and 15 inches deep was

constructed in the concrete floor, this pan being provided with suitable water supply, drain and overflow pipe. A specially constructed strainer occupying 10 per cent. of the area, through which the circulating pump draws its supply, is also placed in the water pan. The initial water supply is delivered to the sprays in continuous circulation until the temperature becomes too high for cooling purposes, when the supply is renewed. The apparatus is also arranged so that a continuous supply of fresh water may be had to maintain a given temperature.

The spray chamber, of heavy galvanized iron, is placed immediately over the water pan and is of equal area. The air passes through the chamber horizontally at a velocity of 445 feet per minute and is carried through the spraying system which is capable of spraying 185 gallons of water per minute at a pressure of 10 pounds.

The special feature of this spray is the adjustable spoon nozzle, which allows the operator to employ either an atomized or sheet spray of varying degree, according to the requirements of the case.

In the present instance, with the water from an artesian well at a tem-



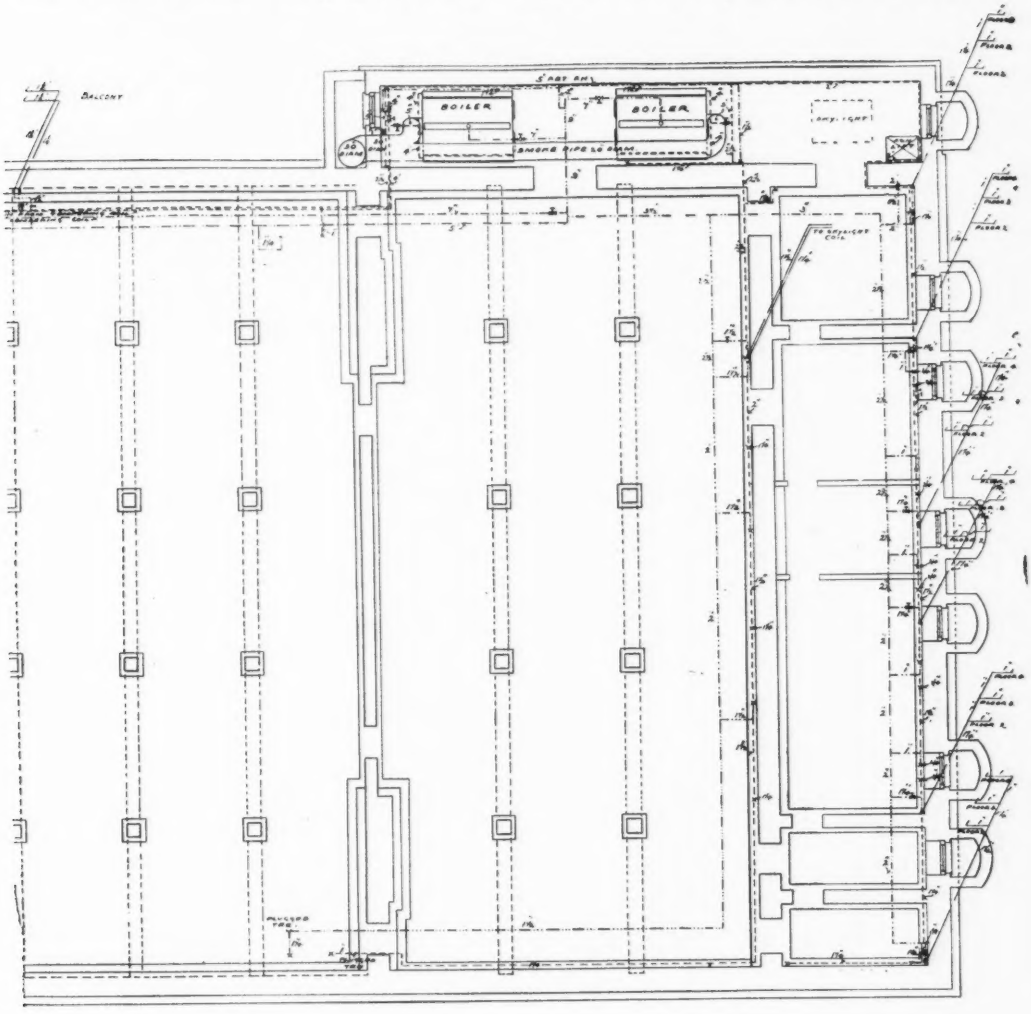
PLAN OF BASEMENT, ROYAL ALEXANDRA THEATRE, SHOWING

perature of 50 degrees or less, the adjustment will allow of cooling the air to practically the water temperature.

The eliminator chamber joins the spray box at the rear and is set with six rows of plates, designed with regard to the velocity and current of the machine which removes from the air treated any moisture in suspension above the normal degree. The water arrested by the eliminators falls upon an apron and returns to the water tank.

After passing through the eliminator the air is delivered to the fan. The total delivery being 30,000 feet per minute. This apparatus is the well-known Acme type, built by Thomas & Smith, and is very similar to apparatus installed by this firm recently in the Majestic Theatre, Chicago, and in the Hippodrome Building, Cleveland.

The air, after passing through the air washer, is delivered to the throat of the fan in the fan wall between the air washing chamber and the heating chamber. This fan, which takes care of the entire air supply, is a 90-inch Baldwin forward direction, centrifugal cone pressure fan driven at 200 R. P. M. by means of an 8-inch



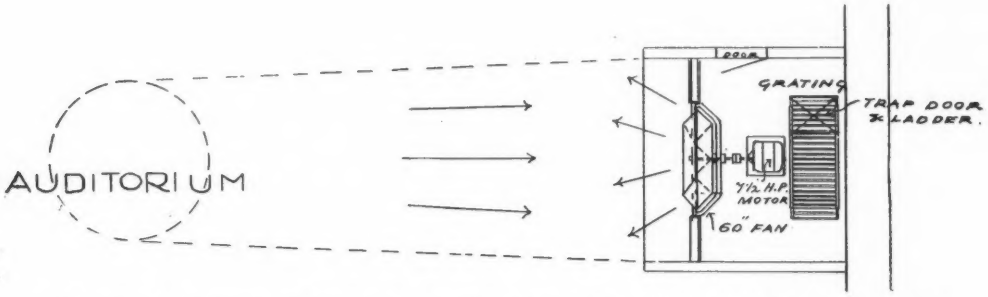
HEATING AND VENTILATING APPARATUS AND PLENUM CHAMBER

belted 12½ H. P. direct current motor, run at about 800 R. P. M. The fan at this speed delivers about 2,000,000 cubic feet of air per hour.

The heating coil is composed of approximately 2,500 square feet of indirect radiation, with by-pass above the coil. There are dampers above and below the stack which are operated by means of a thermostat placed in the plenum chamber and a main thermostat in the auditorium.

The air is admitted from the plenum chamber to the auditorium through about 400 cast iron "mushrooms," each 3 inches in diameter, clear opening, placed under the seats, as already mentioned.

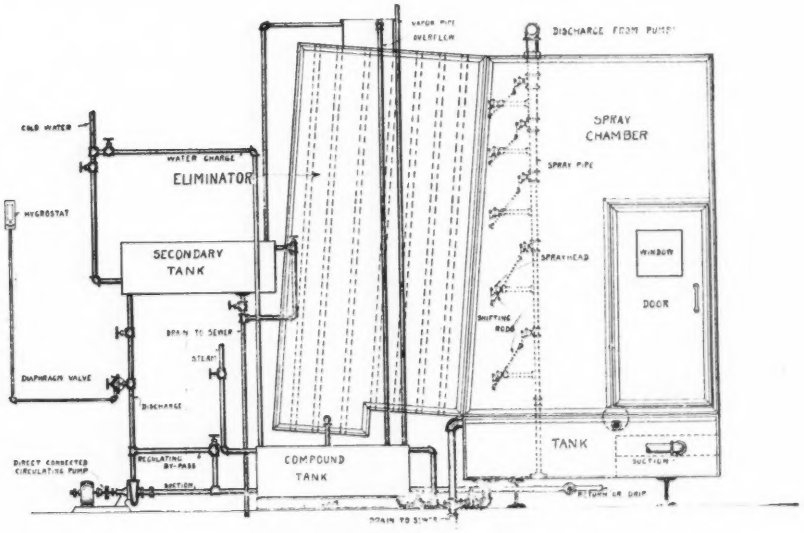
There are two openings in the plenum chamber for supplying the vestibule, each of about 3 square feet and each having supplementary indirect radiators hung at the base of the flue to increase the temperature of the air to about 125 degrees.



PLAN OF VENT DUCT LEADING FROM DOME OF THE ROYAL ALEXANDRA THEATRE
(A Number of Other Vent Ducts Connect at the Dome with This Duct)

There is an exhaust fan placed in the roof house over the auditorium. This fan is 60 inches in diameter and is run by a 7½ H. P. direct connected motor at 300 R. P. M. This fan chamber is connected with eight outlets in the main ceiling (which are not shown in the illustration) and a large center opening, by means of galvanized iron ducts.

Register screens are placed at all



TYPICAL INSTALLATION OF ACME AIR WASHER, EQUIPPED WITH AUTOMATIC HUMIDITY CONTROL

hot air and vent openings and the entire work is painted and bronzed.

The architect of the building is John M. Lyle, of Toronto; Messrs. Carrere & Hastings, of New York, are associate architects. The heating and ventilating engineers and contractors for the work are the Baldwin Engineering Co., of New York. The building was begun last fall and is about finished.

The Ventilation of the House of Commons*

By Walter Yates, Manchester, Eng.

The ventilation of the House of Commons has been a subject for discussion, I suppose, since the time the building came into being, and it is probable that the discussion will go on until long after the building has ceased to be the center of activity it is at present.

It was thought, however, by your president, that a description of the methods now employed there might be of some interest to this Institution, and at his special and urgent invitation I undertook to bring before you such a description. I think, however, it will add to the interest if I first say something of the original methods employed.

ORIGINAL METHODS OF VENTILATING THE COMMONS

In May, 1902, a Select Committee sat for the consideration of the ventilation of the House of Commons, and Mr. E. G. Rivers, the chief engineer to His Majesty's Office of Works, in giving evidence before that committee, thus described these earlier methods:

"From the earlier records compiled from the evidence taken before the various Select Committees in connection with the heating and ventilation of the House of Parliament, it appears that the first attempt in this direction was based upon the following system:

"The intakes of air were at a high level, viz., the Victoria Tower, the Clock Tower and other towers of less altitude, the principal intake being at the top of the Victoria Tower. By mechanical downcast actuated by fans the air was taken to the basement of the building, and warmed and distributed from one point, that is, the chamber under the central hall. Vitiated air was extracted by means of a heat upcast actuated by open fires. The general system at that date—1852—may therefore be described as a combination of very feeble plenum coupled with a heat exhaust.

HIGH AIR INTAKES UNSATISFACTORY

"The following consideration of the principles and working of this system may tend to elucidate the reasons for its subsequent abandonment. In fixing the intakes at the highest possible points, the idea seems to have been that air of greater purity could be obtained at those altitudes, and in the evidence taken before the several committees, this point is frequently alluded to. If the Houses of Parliament were not situated in a thickly built-over neighborhood, and if their own smoke shafts did not discharge at points below these high intakes, such an assumption might hold good, but under the actual conditions there can be no question that the high level intakes must have been most seriously affected by the emanations from the numerous chimneys in the near neighborhood. I therefore assume that, as no provision for washing or otherwise purifying the incoming air existed in connection with the original system, the quality of the supply must at times have been most objectionable.

"The next feature which presents itself is the system of mechanical downcast from the intakes. At that date there were very few efficient types of fans able to exert an appreciable water gauge pressure, coupled with easy facilities for driving by power, and it can easily be conjectured that the appliances which were used

*Paper read before the British Institution of Heating and Ventilating Engineers, February 19, 1907, in London, England.

in this connection were both inefficient and noisy in working.

"The whole of the heating surface for the warming of the chambers was concentrated under the central hall, therefore the loss of thermal units between the heating center and the farthest distributing points must have been very considerable. How the system was controlled to meet the varying conditions of occupancy I am at a loss to conjecture."

DESCRIPTION OF FIRST COMPLETE CHANGE IN VENTILATING SYSTEM

In the year 1854 a complete change of the system was made, and this remained in operation until the present system was installed in 1905. Following is a brief description of the arrangements existing between 1854 and 1905:

The air intakes were at low levels, viz., on the terrace or river front, and from certain courtyards; in the former case, the supply was taken in at the basement level, and, in the latter, at the ground level. The intake for the debating chamber of the House of Commons was from the river front, and the supply passed through an airway in the basement to a certain point from which it passed into the chamber at a velocity actuated only by the exhaust, or it was propelled by an engine driven fan at a high velocity.

Means existed for partially washing the air by water spray, and there was provision for cooling the incoming supply in hot weather by contact with blocks of ice, which were carried on racks in the airway. In foggy weather the air by-passed from the fan through a filter of very considerable area, having a six-inch thickness of cotton wool carried on wire netting.

In ordinary weather this filter was not used, and the only screening which the air received on its way to the chamber was that due to its passage through a single thickness of dry scrim cloth fixed on wood frames. These cloths were washed very frequently, and although a large quantity of sooty impurity was intercepted by them, it may be fairly assumed that a further quantity passed through. From the screen point, the air passed to the heating chamber, in which the steam batteries were fixed. Above this was the equalizing chamber (directly under the floor of the House), and the required variations of temperature were obtained at this point by admitting an auxiliary supply of cold air, if necessary, coupled with the control of the steam batteries.

In the original scheme it was intended that the air from the equalizing chamber should ascend through the whole grated area of the floor of the debating chamber, including the rising tiers of seats, but, from various causes, the active area of inlet had been reduced down to the center gangway, the cross gangways and certain vertical panels in the framing at either end of the chamber. From these points on the floor, the air entered through iron gratings with slot perforations of a rather close pattern, and the effective value of the area of inlet was much discounted by the string matting with which the gratings were covered.

The extraction of vitiated air was conducted from the ceiling line of the chamber, and in two directions, viz., by the ventilating shaft over the Commons lobby and by the down pull shafts to the basement, thence by the extracting airway to the upcast at the base of the Clock Tower. Both of these exhaust pulls were actuated by coke fires burned upon open grids. The extraction of vitiated air from the galleries, lobbies, retiring rooms, etc., was included with that from the debating chamber. The vitiated air from the committee rooms was supposed to join the general upcast to the Victoria Tower, but this section, having been found to be inoperative under all conditions, the ventilation of these rooms was, three or four years ago, dealt with upon a separate system.

THE PRESENT SYSTEM OF VENTILATION

Coming now to present conditions, which are the result of the deliberations of the several committees which have sat during the past three or four years, I do not think I could do bet-

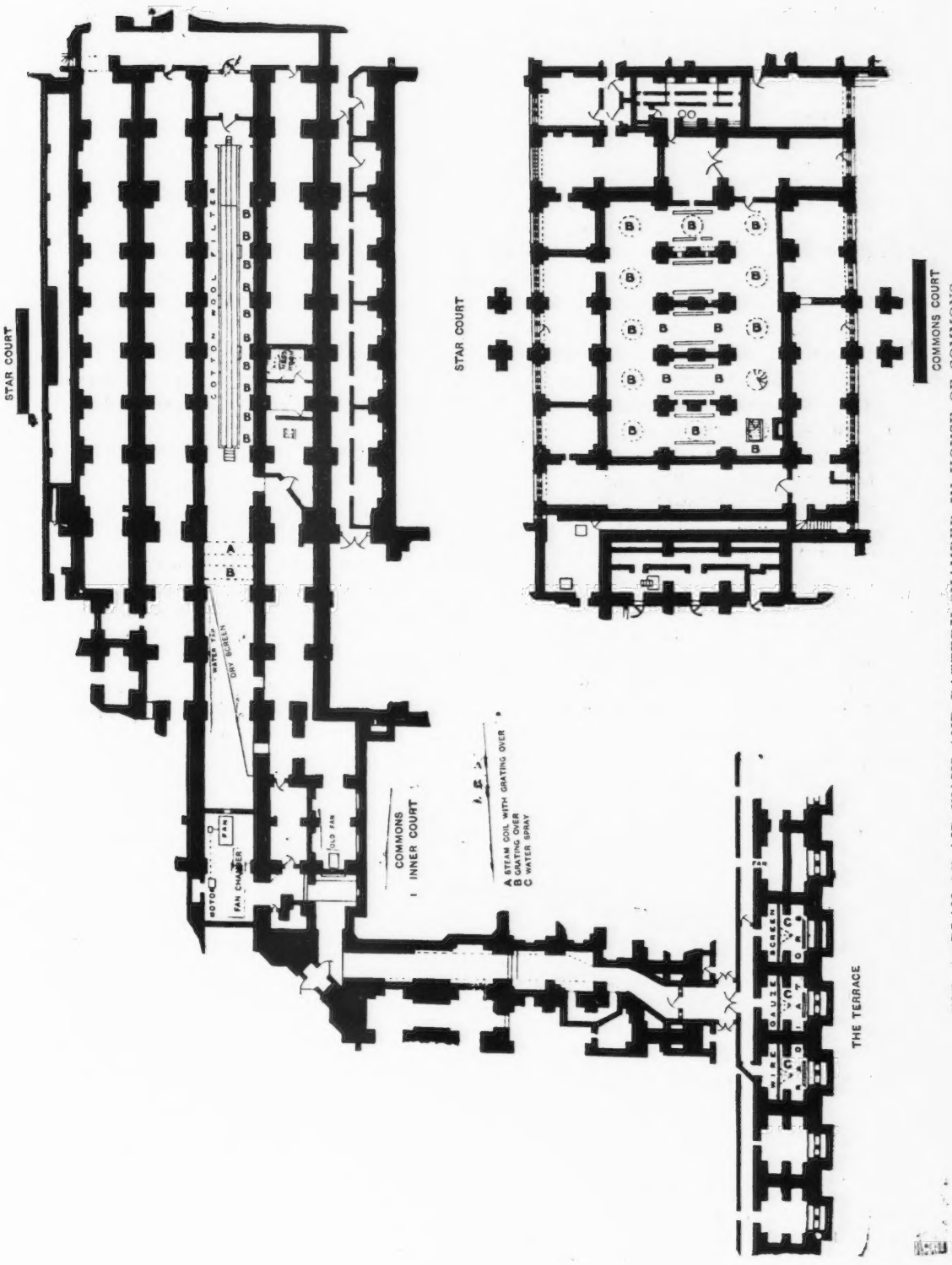


FIG. 1—PLAN OF AIR WAYS AND BATTERY CHAMBER IN HOUSE OF COMMONS

ter than give you here a copy of a sheet prepared by Mr. A. P. Patey, the resident engineer of the House of Commons, for a party of engineers which recently visited the House for the purpose of inspecting the heating and ventilating system:

SYSTEM

Is a plenum one, coupled with exhaust: a condition of working being that the inflow of air to debating chamber is slightly in excess of that extracted.

AIR INTAKES

These are three in number, and situated at basement level on the east side of building, facing the river. At the initial point of air entry are fixed tempering coils or radiators, for the purpose of raising the temperature of the air in cold weather, and so preventing the water being frozen on the water screens placed across the center of these chambers.

WATER SCREENS

The air is then drawn through these water screens—designed by E. G. Rivers, the board's chief engineer—and which consist of sheets of copper gauze, 20 meshes to the linear inch, supported on framework, and fixed vertically across the whole sectional area of each chamber. Immediately in front of each screen are water sprays of the impingement type, which keep the screens continually moist: the waste water drains to a sump, and by an electric pump, automatically controlled, is used again for boiler feed purposes. The effect of this screen is to remove a little over 60 per cent. of the bacteria from the terrace air, increase the humidity, wash out a large proportion of the fog, and to give a marked cooling effect.

INPUT FAN

The air supply then passes along a glazed tile duct or passage about 100 feet in length to the input fan. This is of the centrifugal cased type, having 8-foot diameter runner, and belt driven by electric motor of 25 horsepower. The speed of the fan can be raised, by graduations of 1 revolution, from 100 to 190 r. p. m.; the volume of cubic feet of air propelled per minute being from 20,000 to 60,000 cubic feet.

AIR LOCKS

Between the fan point and water screen chambers are fixed special air tight double doors, to form air locks and prevent side leakage of air of an undesirable character from the basement corridors communicating with this portion of the airway.

FAN DISCHARGE

From fan discharge the air travels horizontally along a further length of tiled passage until reaching the fog filter, when it rises vertically through the heating and equalizing chambers, the latter being directly under the floor of the debating chamber.

FOG FILTER

Is of "V" construction, and fixed in a separate independent vault, the same length as the debating chamber. In time of fog the air is by-passed to this filter by means of a special diverting screen, which is also air-tight in character. Arranged on either side of the "V," in panel form, are the movable cotton wool baskets, having a total wool thickness of from 4 to 6 inches.

HEATING CHAMBER

This chamber is practically of the same floor area as the debating chamber. The radiators, of the double-column type and 40 in number, are distributed in the center and sides over the whole area. The system of heating is by the Warren Webster atmospheric low pressure steam, which allows of a low temperature on the radiators.

EQUALIZING CHAMBER

The air entry to this chamber is by 12 circular gratings at sides and ends, and three large oblong gratings in center. As the name implies, the air is here made equable in velocity and temperature. The control of the whole system is from this point.

DEBATING CHAMBER

From the equalizing chamber the air enters the debating chamber by the perforated center and cross gangways

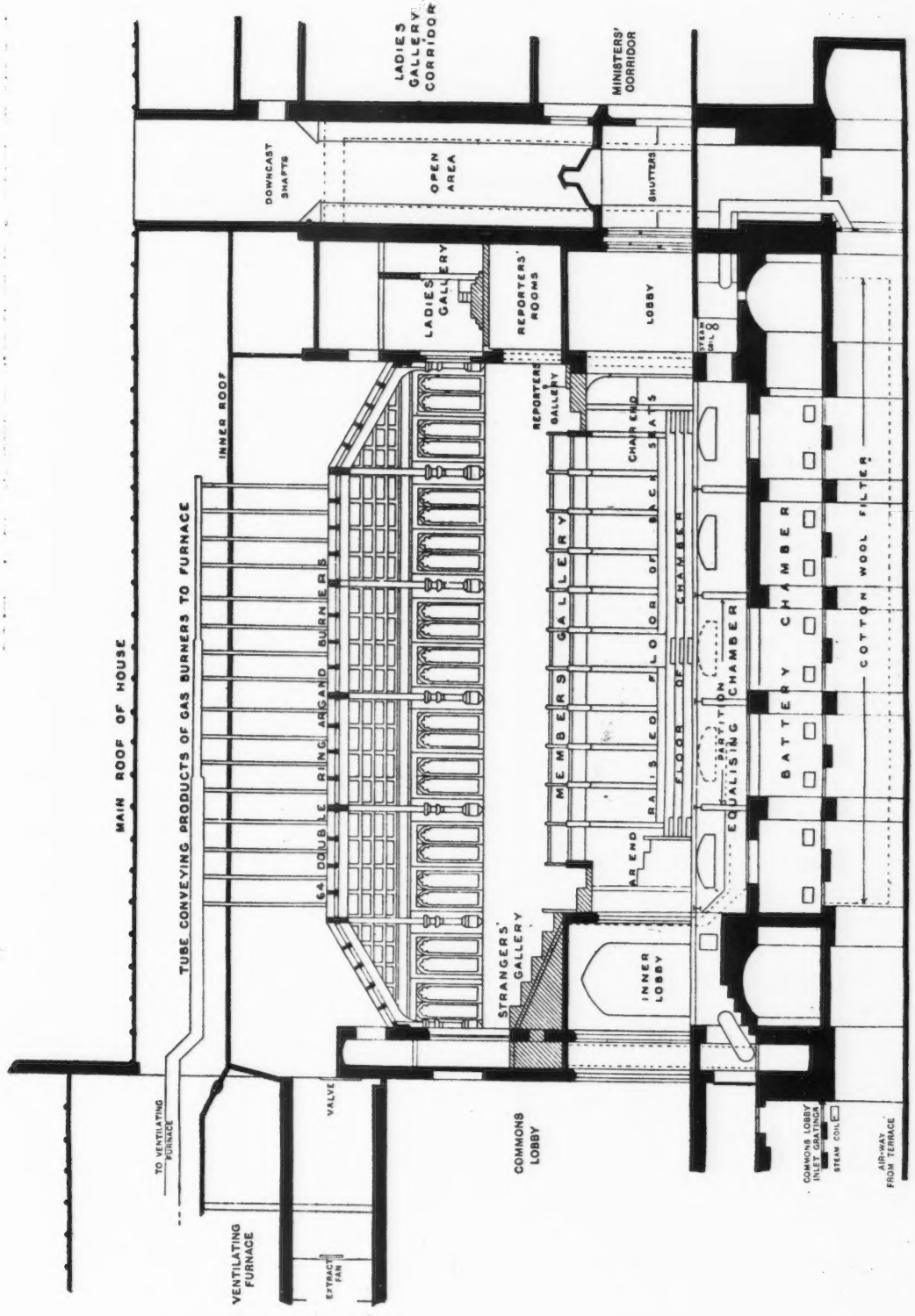


FIG. 2.—LONGITUDINAL SECTION, HOUSE OF COMMONS, SHOWING ARRANGEMENT OF HEATING AND VENTILATING APPARATUS

and by the "valance" and "slit" inlets which extend the whole length of all the benches. In addition, air is also free to pass laterally through five openings or "port-holes" in the side walls of the equalizing chamber into the space beneath the floor, and which provides the supply for the division lobbies.

OUTFLOW

The vitiated air is extracted through the slightly raised panels of the debating chamber by a similar fan to the input fan in the basement. This fan is fixed over the lobby, and discharges its air into a vertical shaft 70 feet in height. Its speed can be regulated in the same manner as the input fan. The outflow of air is further controlled by a hydraulically operated "shutter valve" through which all air extracted from the debating chamber must pass. At each side of this shutter are two swing doors communicating by shaft to the vitiated air space over Division lobbies. During divisions the output fan can be made to pull wholly, if required, from the Division lobbies. This is a flexible arrangement whereby the whole system can be varied according to where the members of the House happen to be.

GAS LIGHTING

Is by 64 sun burners; the draught from these being sufficient to renew the air contents of the chamber once during the hour.

GALLERY VENTILATION

A fan capable of discharging 10,000 cubic feet per minute is fixed in a chamber, a continuation of the one where the air takes the vertical flow from the basement. The air is first warmed by tubular heaters—which can be by-passed in summer—and passing through fan, is discharged vertically to the rising shafts in side and end walls of equalizing chamber and communicating with the velocity reducing chambers extending under the benches of the various galleries; from these chambers the air finds its way at a low level into the debating chamber and joins the main extraction.

PLANS SHOWING PRESENT SYSTEM OF VENTILATION

In order the better to understand the foregoing description, it will be well now to examine the several plans of the House which are included with this paper, and which have been reproduced from Dr. Gordon's report on the ventilation of the House of Commons, by permission of the controller of His Majesty's Stationery Office:

Fig. 1 is a plan of the airways in the basement. In the bottom left hand corner is shown the terrace on the river front from which the air is taken. It will be noticed that immediately inside the building are three chambers, in which are the water screens. Each screen forms a complete partition in its own chamber from floor to ceiling and from side to side, so that all air which is drawn by the fan through the openings to the terrace must pass through these screens, which are always kept thoroughly covered with water whenever the input fan is at work.

The total area of these screens is 270 square feet. There are 24 water jets in use, and these take 600 gallons per hour in keeping the screens clean.

It will be noticed that just inside the inlets from the terrace are radiators, which sufficiently raise the temperature of the incoming air in very cold weather, to prevent freezing up of the water screens.

In the top left hand corner is shown the fan chamber which contains the input fan and motor driving same.

The air passage connecting these screens with the fan chamber has been somewhat modified since this drawing was made. At the points where it was contracted it has been enlarged, and the various corners have been rounded so as to give the air a much freer passage and thus cause less resistance.

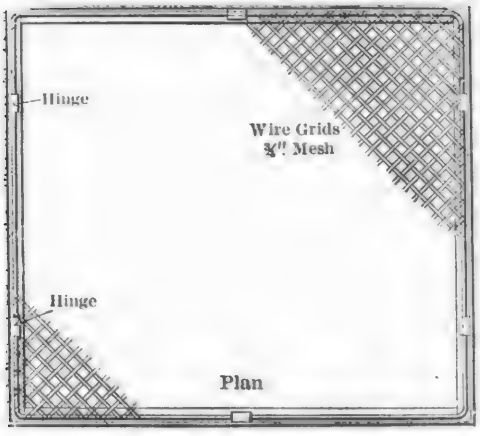
An alteration has also been made to the doors communicating with this passage since this drawing was made. As described by Mr. Patey, the ordinary doors have been removed, and air-tight double doors to form air locks and prevent leakage of an un-

desirable character have been fitted. This drawing also shows the dry screen, but this has now been removed, as, with the water screen and cotton wool filter, it was found quite unnecessary.

OPERATION OF COTTON WOOL FILTER

At the opposite end of the vault or long passage from the fan chamber you will notice the cotton wool filter is shown, but again a modification has been made, this filter now being in the adjoining vault to that shown. The arrangements are now such that in the absence of fog, the cotton wool

End View



DETAIL OF WOOL BASKET FILTER

filter is quite isolated from the system, the air passing straight from the fan discharge to the heating chamber. When, however, the presence of fog necessitates the use of the cotton wool filter, the direct connection between the fan and the heating chamber is closed, and the air diverted through the filter previous to its entry into the heating chamber.

As you would notice from the description of the fog filter, it is of V construction, the air entering the V on the upper side and issuing in a purified state to the two outsides of the V and thence to the heating chamber. As this fog filter is not an everyday occurence, perhaps a few details of its construction will be of interest.

It consists, as already mentioned, of a framework in the form of a V, this frame being 60 feet long, and each side about 5 feet deep. This framework supports wire baskets each measuring 3 ft. 1 in. by 2 ft. 9½ in. by 3 in., and into each of these baskets is placed cotton wool specially prepared for the purpose, and, when all are in position, they form practically a wall of cotton wool through which the air must pass.

In Fig. 1 is also shown a plan of the battery or heating chamber. The details of this chamber have also been modified to some extent since this drawing was made, a number of interfering partition walls having been removed. This chamber is practically the same size as the House itself. The total heating surface located here amounts to 3,600 square feet.

Between the heating chamber and the debating chamber is the equalizing chamber, and on reference to Fig 2, which is a longitudinal section of the debating chamber with the various rooms adjoining, it will give a clear idea of the general arrangement in elevation. At the bottom left hand corner of the sheet is indicated the airway from terrace, and you will note on this same level is the cotton wool filter. Above this comes the battery chamber and above this again the equalizing chamber, and then the debating chamber itself. The method of getting the air from the equalizing chamber into the House—that is, through the floor — has probably caused more discussion than any other feature of the system here employed, but as I was asked to give a description—not a criticism—I will content myself at this point by merely stating the fact.

Fig. 3, which is a cross section of the debating chamber and Division lobbies, shows by arrows how the air enters the equalizing chamber into the House. It will be noticed that a portion passes through the center and cross gangways, and that there are

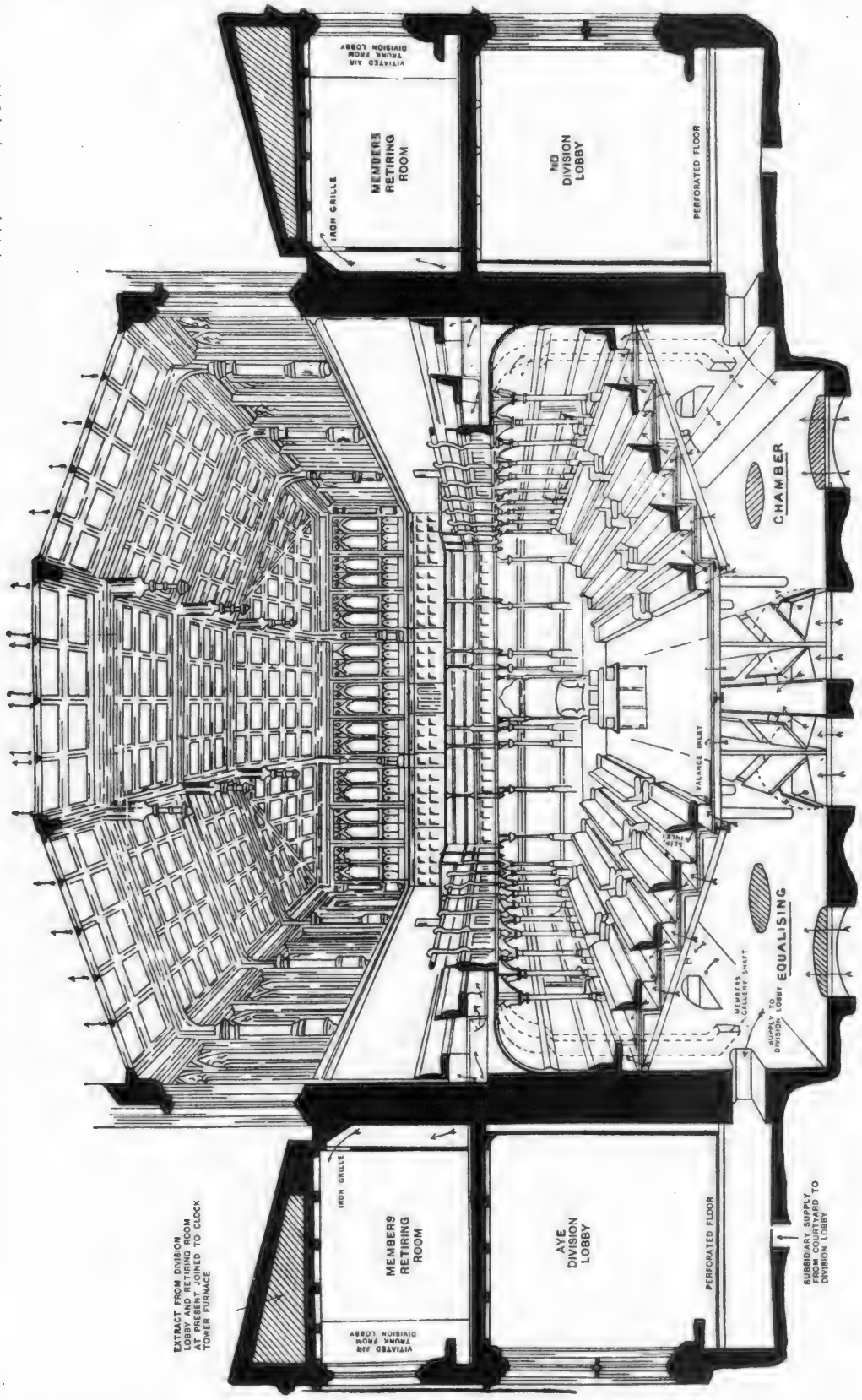


FIG. 3—CROSS SECTION, HOUSE OF COMMONS, SHOWING VENTILATING ARRANGEMENTS FOR DEBATING CHAMBER AND DIVISION LOBBIES

also "valance" and "slit" inlets all along the seated portion of the House. By thus spreading the inlet into the House over a very large area, the air is admitted at a very low velocity. You will notice also that from the equalizing chamber the air also passes to a cavity under each Division lobby and thence through the perforated floor of each into the lobbies themselves.

EXTRACTION OF VITIATED AIR

And now, having followed the course of the air from the river front to the House, we may turn to the consideration of the extraction if vitiated air as illustrated by the same figures.

Fig. 3, again by arrows, shows that the air is passed through the ceiling of the debating chamber at a great many points, as can be seen from the

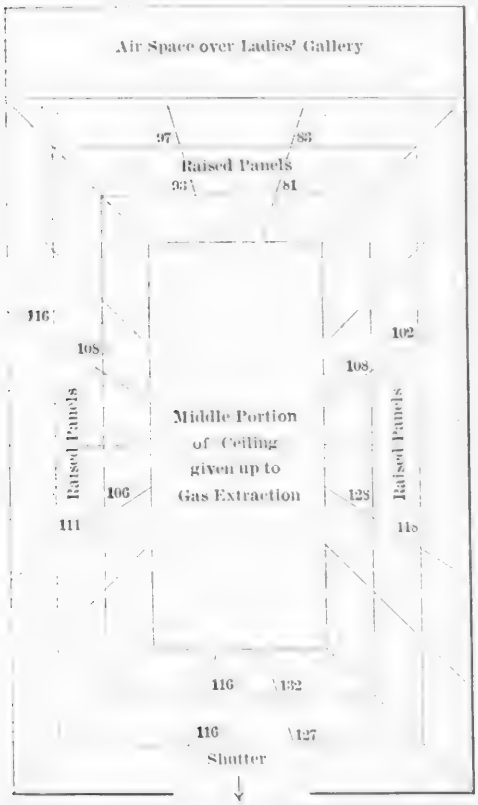


DIAGRAM OF CEILING, HOUSE OF COMMONS

illustration. The ceiling consists of a large number of glazed panels, and, as already described, these panels are slightly raised, thus forming an airway all round them into the space between the ceiling and the inner roof. Turning now to Fig. 2 the arrangement for lighting the House will be noted, viz., by 64 double ring Argand burners, which are placed above the glazed panels already alluded to, the products of combustion from each burner being conveyed by vertical branch pipes into a horizontal pipe, which is located between the inner roof and the main roof, and passes to the atmosphere quite independent of the ventilating system. The space between the ceiling and inner roof is practically air tight, save for the spaces round the panels and the aperture at one end which communicates with the main extracting chamber in which is situated the extract fan. You will notice that immediately above the extract fan there is marked on the illustration a ventilating furnace, but this is now removed and full reliance placed upon the extract fan.

In Mr. Patey's description of the general arrangements it is stated that the outflow of air, in addition to being controlled by regulating the speed of the extract fan, can be further controlled by a hydraulically operated "shutter valve" through which all air extracted from the debating chamber must pass. This valve is indicated, as you will notice, partially covering the aperture communicating between the space above the ceiling and the extract fan.

The last paragraph of Mr. Patey's description refers to the gallery ventilation. The fan there referred to is situated in the long chamber in the basement at the end opposite to that where is shown on Fig. 1 the input fan. This fan has not an independent supply, but takes its air from the main input fan. The vertical shafts in the side and end walls of the debating chamber, which supply air to the galleries, originally obtained their supply from the equalizing chamber, but these are now disconnected from the latter and carried down to the bottom chamber, where they are connected to the fan just mentioned, and thus have a more positive supply than previously was obtainable.

RESULTS OBTAINED WITH PRESENT SYSTEM

And now, having described the system as at present working, we may pass to a consideration of the results obtained.

To those with a desire for ample detail and having abundance of time at their disposal, I would recommend the perusal of the numerous Blue Books issued by His Majesty's Stationery Office, but in particular to a report by Dr. M. H. Gordon, on his "Investigation of the Ventilation of the Debating Chamber of the House of Commons," No. C.d. 3,068, and published by Darling & Son, Ld, 34-40 Bacon street, London, E., but as most of you probably have not the time, even if you had the desire, to bury yourselves in these volumes, I have endeavored to extract a few particulars which will give you some idea of what the apparatus recently installed in the House is actually doing.

(*To be Concluded in the May issue*)

Central Heating System for Fifty-one Detached Buildings

Central Power Plant, Hot Water Heating System and Hot Water Supply System for the New York Juvenile Asylum, Dobbs Ferry, New York

The New York Juvenile Asylum, including at present 19 detached buildings, and with provisions for another group of 32 buildings to be built at a future time, occupies a commanding position at the summit of a hill just back of the village of Dobbs Ferry, New York. Owing to its location, it receives the full sweep of the wind from the west and north as it comes across the Hudson River, and on this account, during the heating season, the heat losses figure considerably above those usually found in that section.

Most of the buildings are cottages, some with dormitories and the others having separate bedrooms.

The remaining buildings include a kitchen building, in the sub-basement of which is the power and heating plant, and at present one school building. In addition to the future cottages, provision has been made for a future school building, a gymnasium, a chapel and other buildings.

The buildings are heated from a central plant by the Evans Almirall system of hot water heating by forced circulation. All light and power is furnished from the central plant. Hot water for lavatory purposes is also furnished from the central power plant. All food is cooked in the kitchen building and taken by automobile to the different cottages and there reheated in a hot closet and then served.

GENERAL DESIGN

In the general design it was the aim to centralize the lighting, power, heating, kitchen and laundry in one building, making use of all the exhaust steam available for heating and hot water lavatory supply purposes in an endeavor to reduce the coal consumption to the lowest possible point and require a small operating force.

Hot water was chosen as the heating medium because: (1) it was the only possible method on account of the grades to reach all the buildings (the longest circuit at present is 3,800 feet, and the loop to the future girls' group will be close to 10,000 feet) and use the exhaust steam. (2) Because of the economy in operation. There being but a limited amount of exhaust steam, it was desired to use that to the fullest extent, using live steam only when actually necessary, and the exhaust steam was insufficient. (3) Because of the desire to maintain a constant temperature in the buildings at all times, regardless of the outside temperature, and without the aid of temperature regulation. This is done by the engineer at the power house, by regulating the temperature of the circulating water according to the outside temperature

and thereby maintaining 70 degrees indoors at all times.

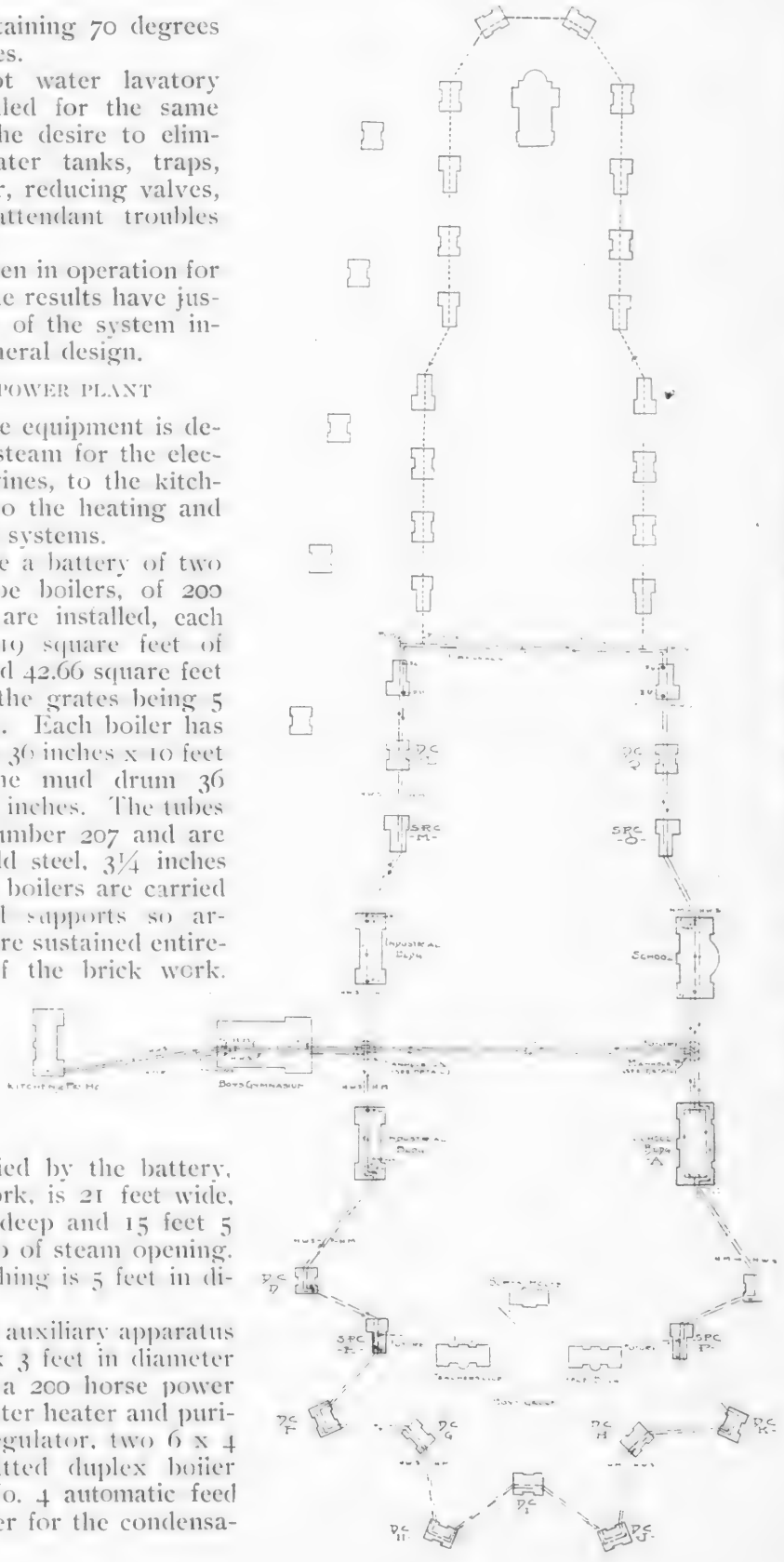
The central hot water lavatory system was installed for the same reasons, besides the desire to eliminate the hot water tanks, traps, pump and receiver, reducing valves, etc., and their attendant troubles from the building.

The plant has been in operation for two winters and the results have justified the adoption of the system installed and the general design.

BOILERS AND POWER PLANT

The power house equipment is designed to furnish steam for the electric generator engines, to the kitchen, laundry, and to the heating and hot water lavatory systems.

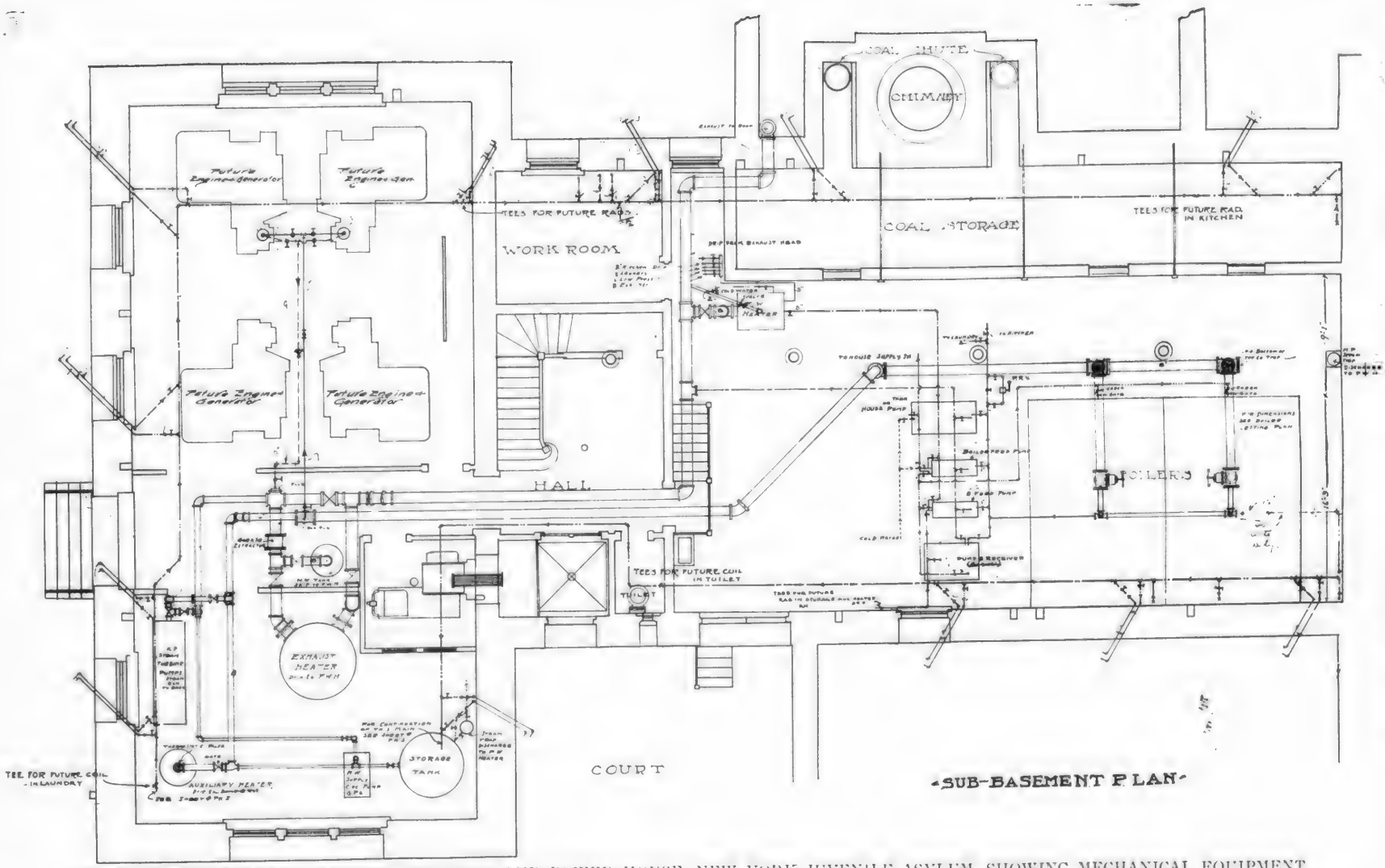
For this purpose a battery of two Stirling water tube boilers, of 200 horsepower each, are installed, each boiler having 2,019 square feet of heating surface and 42.66 square feet of grate surface, the grates being 5 feet 4 inches deep. Each boiler has three steam drums 36 inches x 10 feet 9 inches, and one mud drum 36 inches x 9 feet 2¼ inches. The tubes for each boiler number 207 and are of lap-welded, mild steel, 3¼ inches in diameter. The boilers are carried on wrought steel supports so arranged that they are sustained entirely independent of the brick work.



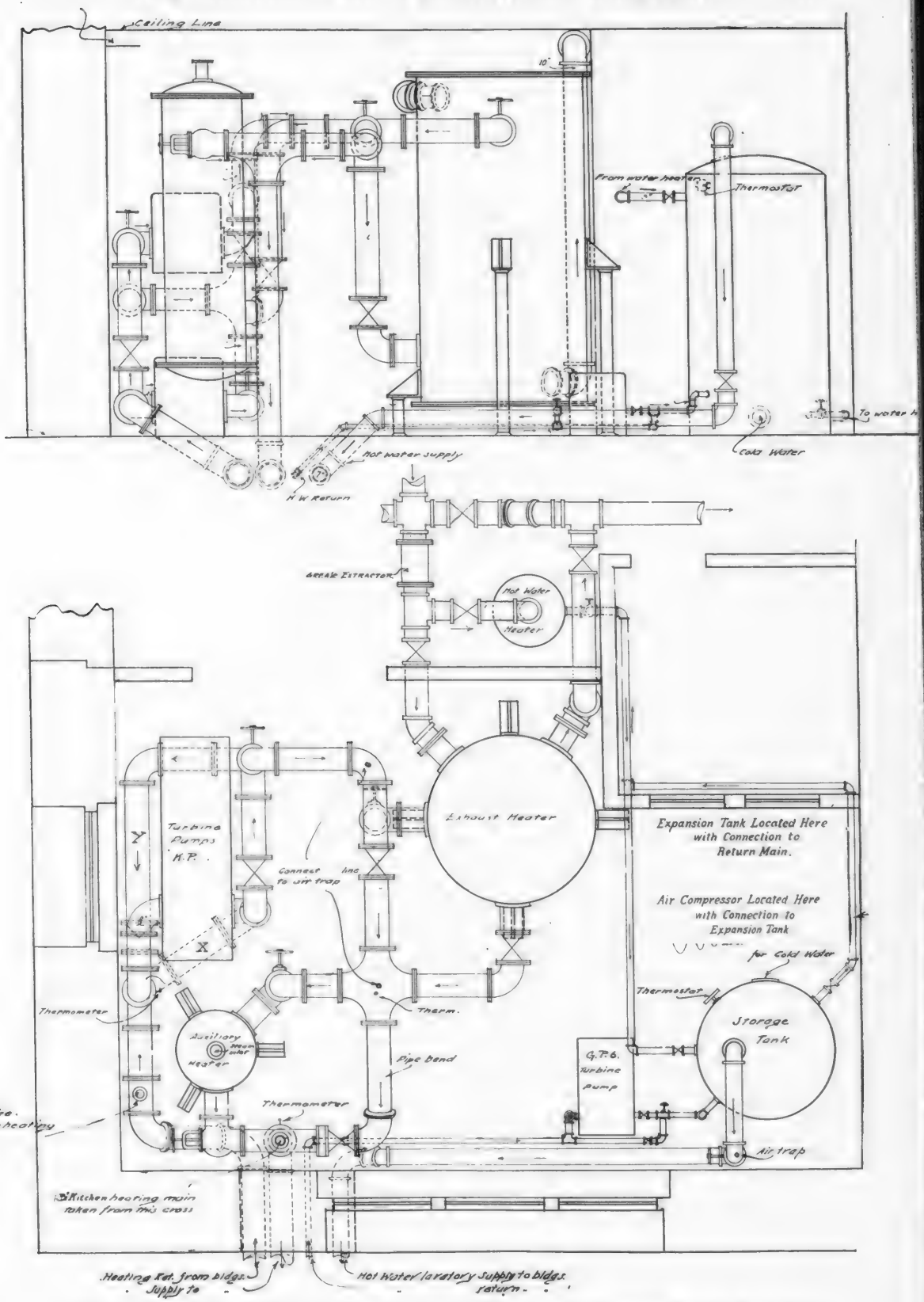
GENERAL PLAN OF GROUNDS, NEW YORK JUVENILE ASYLUM

The space occupied by the battery, including brickwork, is 21 feet wide, 16 feet 3 inches deep and 15 feet 5 inches high to top of steam opening. The smoke breeching is 5 feet in diameter.

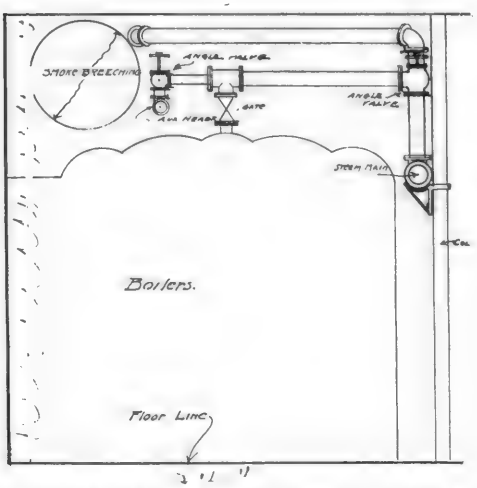
Included in the auxiliary apparatus is a blow-off tank 3 feet in diameter and 6 feet long, a 200 horse power Cochrane feed water heater and purifier, a damper regulator, two 6 x 4 x 6-inch brass-fitted duplex boiler feed pumps, a No. 4 automatic feed pump and receiver for the condensa-



PLAN OF SUB-BASEMENT, KITCHEN BUILDING AND POWER HOUSE, NEW YORK JUVENILE ASYLUM, SHOWING MECHANICAL EQUIPMENT



DETAIL OF CONNECTIONS TO HOT WATER HEATERS IN SUB-BASEMENT OF KITCHEN AND POWER HOUSE, NEW YORK JUVENILE ASYLUM



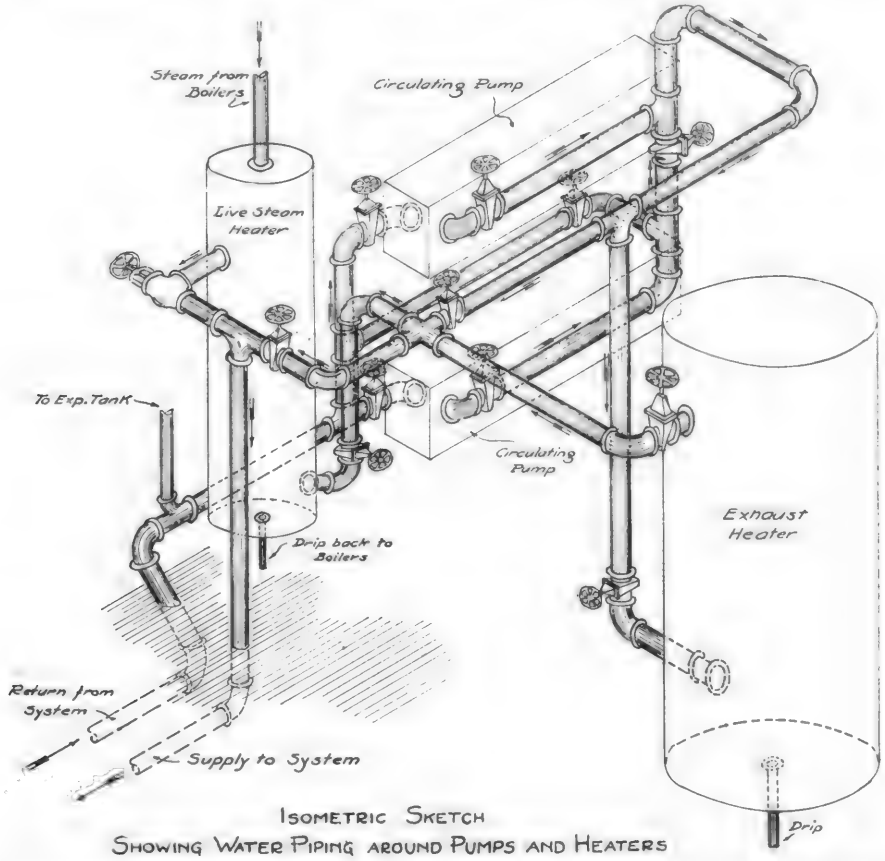
SIDE ELEVATION OF BOILERS IN POWER HOUSE, SHOWING CONNECTIONS TO STEAM HEADER

tion from the live steam heater, a No. A1, Class A, Albany return steam trap, to be used particularly for the return of the condensation in the various fixtures of the kitchen and laundry room and a 12-inch vertical grease extractor. An exhaust head of special design is connected on the top of the main exhaust line.

MAIN STEAM LINE

From each boiler a connection is carried over into a main steam line, which is then extended through the building to the engine room, where it divides. One branch is carried into the engine room to the engines and the other into the pump room. From the pump room branch, a connection is made to two DeLaval turbine pumps for circulating the water in the heating system, to a pump for circulating the water in the lavatory system, and also to a pump used for filling the storage tank, and to a special live steam heater, as shown on the plans.

From the other end of the boiler nozzle there is a connection into a header from which connections are made to the feed pumps, pump and

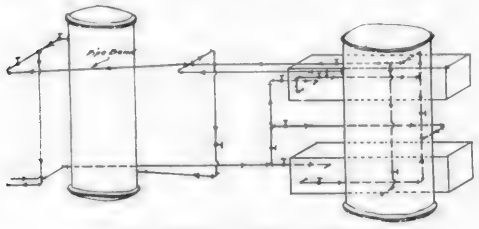


ISOMETRIC SKETCH SHOWING WATER PIPING AROUND PUMPS AND HEATERS

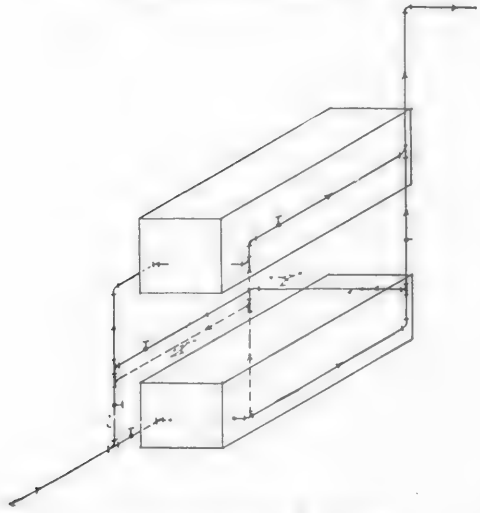
receiver, and to the laundry and kitchen.

MAIN EXHAUST LINE

From each of the engines an exhaust connection is carried into a main exhaust line which is run in a trench under the floor. The exhaust connections from the several pumps are also connected together and carried over to the main exhaust line.



HEATING APPARATUS

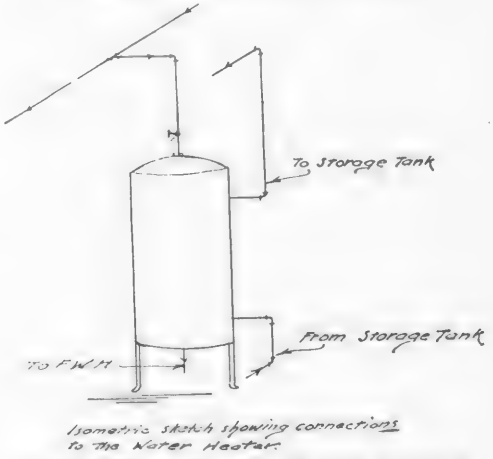


ARRANGEMENT OF PUMPS

tions are made to vegetable boilers, cook table, warming table, coffee urns, etc. The drips from these fixtures are connected into a main drip line, which is trapped, with by-passes. The discharge from these drips is carried down to the main return trap, already mentioned.

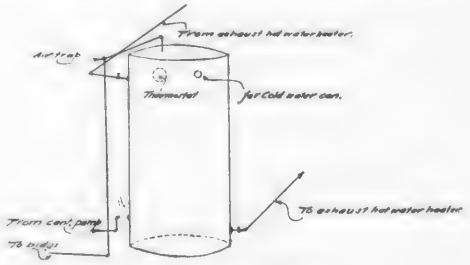
LAUNDRY CONNECTION

A high pressure steam line is



Isometric sketch showing connections to the Water Heater.

CONNECTIONS TO THE WATER HEATER



STORAGE TANK

ISOMETRIC SKETCHES OF HOT WATER HEATING APPARATUS IN SUB-BASEMENT OF KITCHEN BUILDING, NEW YORK JUVENILE ASYLUM

At the latter connection, the line is increased in size and connected to the grease extractor and thence to the large heater for the heating system, with by-pass. From this point the exhaust line is carried over to the heater for the lavatory system where the exhaust line rises to the ceiling and is carried overhead to the feed water heater, with by-pass, and thence to the roof.

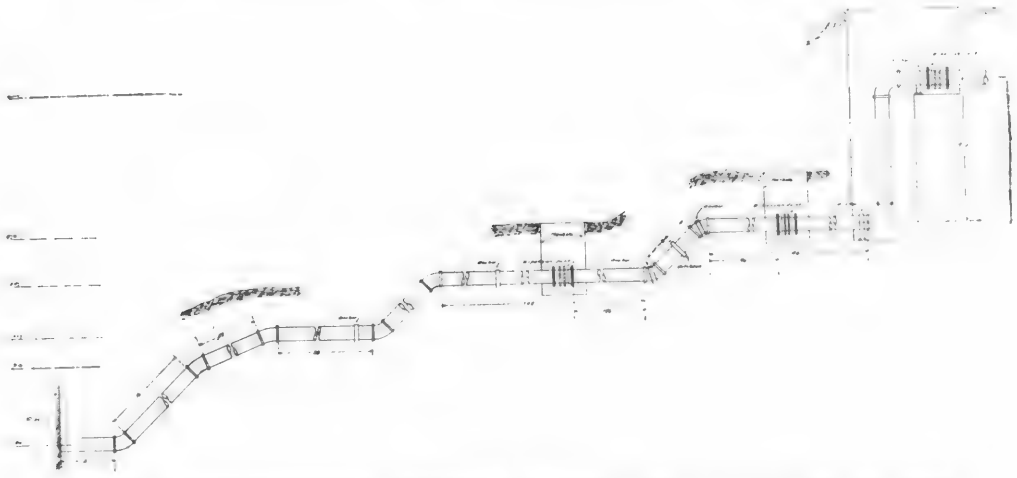
KITCHEN PIPING

A steam line is taken from the main header in the boiler room and carried up and distributed in the kitchen. From this main, connec-

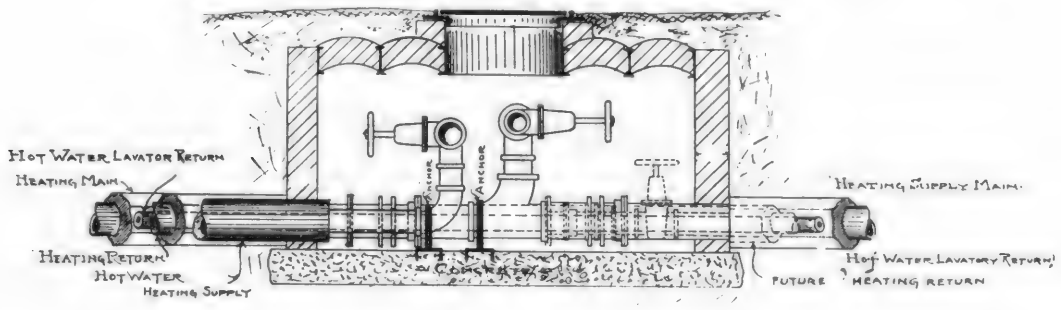
carried to the laundry, connecting with the various fixtures there, also dripped, with traps. All of the high pressure piping is covered with "J-M" fire felt, 1 inch thick. The exhaust lines are covered with 1-inch thick asbestos of the H. W. Johns-Manville make. The steam mains and return connections to the kitchen and laundry apparatus are similarly covered.

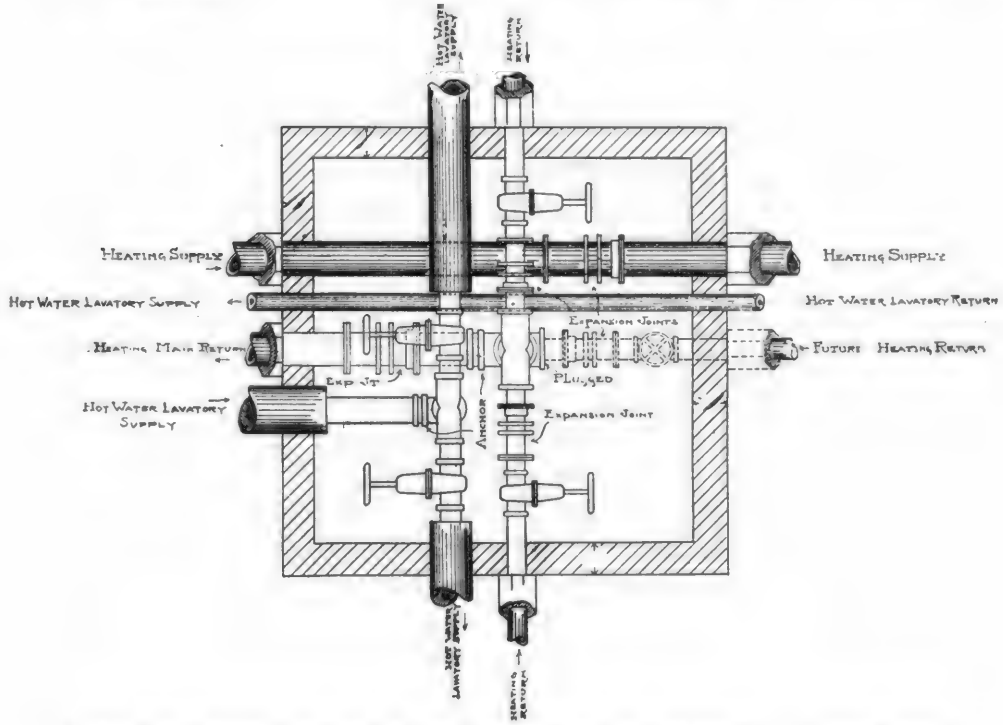
HOT WATER HEATING MAINS AND SPECIAL APPARATUS

In this equipment is included the special heaters, circulating pump and outside underground mains. It

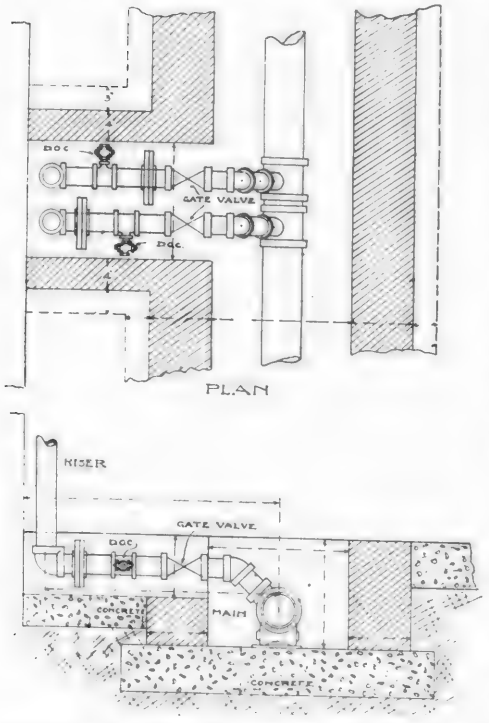


DETAIL OF HEATING MAIN, NEW YORK JUVENILE ASYLUM, LEADING UP FROM POWER HOUSE





PLAN AND ELEVATION OF ONE OF THE MANHOLES (MANHOLE A), NEW YORK JUVENILE ASYLUM



DETAIL OF TRENCH FROM MAIN LEADING TO SCHOOL BUILDING A, NEW YORK JUVENILE ASYLUM

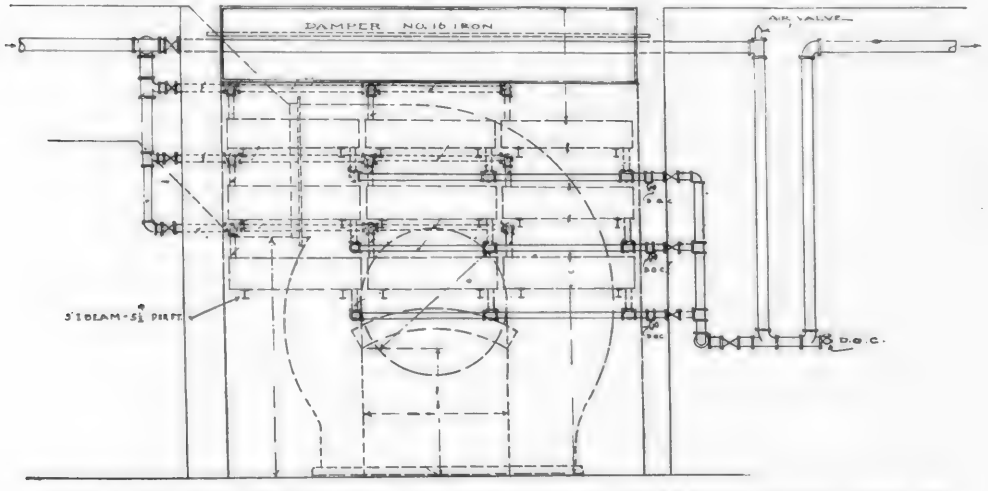
should be noted that the apparatus and underground mains are of such capacity as to provide not only for the buildings now built, but also for the remaining buildings that are planned, consisting of two industrial buildings, one school building, 25 cottages, a superintendent's house, an office building, a teacher's club and a chapel.

The exhaust heater consists of a tubular shell about 6 feet in diameter and about 14 feet long, so arranged that the tubes allow a free passage of the exhaust steam through them and the heater is of sufficient size to condense all the exhaust steam available.

There is also an auxiliary heater constructed in general like the exhaust heater, large enough with steam at 100 pounds boiler pressure, to heat to the required temperatures all the water necessary to be circulated for the present buildings.

The circulating water is primarily heated in the exhaust heater, and if, owing to an insufficient amount of exhaust steam, not warmed to the temperature desired, it is then passed through the live steam heater, to which sufficient live steam is admitted to obtain this result. From this heater the water goes to the buildings, thence back to the circulating pumps and to the exhaust heater, making a complete circuit. A Davis and Roesch hot water tank regulator is connected to the flow pipe after it leaves the auxiliary heater so that the temperature of the circulating water is automatically regulated to the point desired by the engineer.

Two centrifugal pumps are installed that are especially designed for the work they are called upon to do



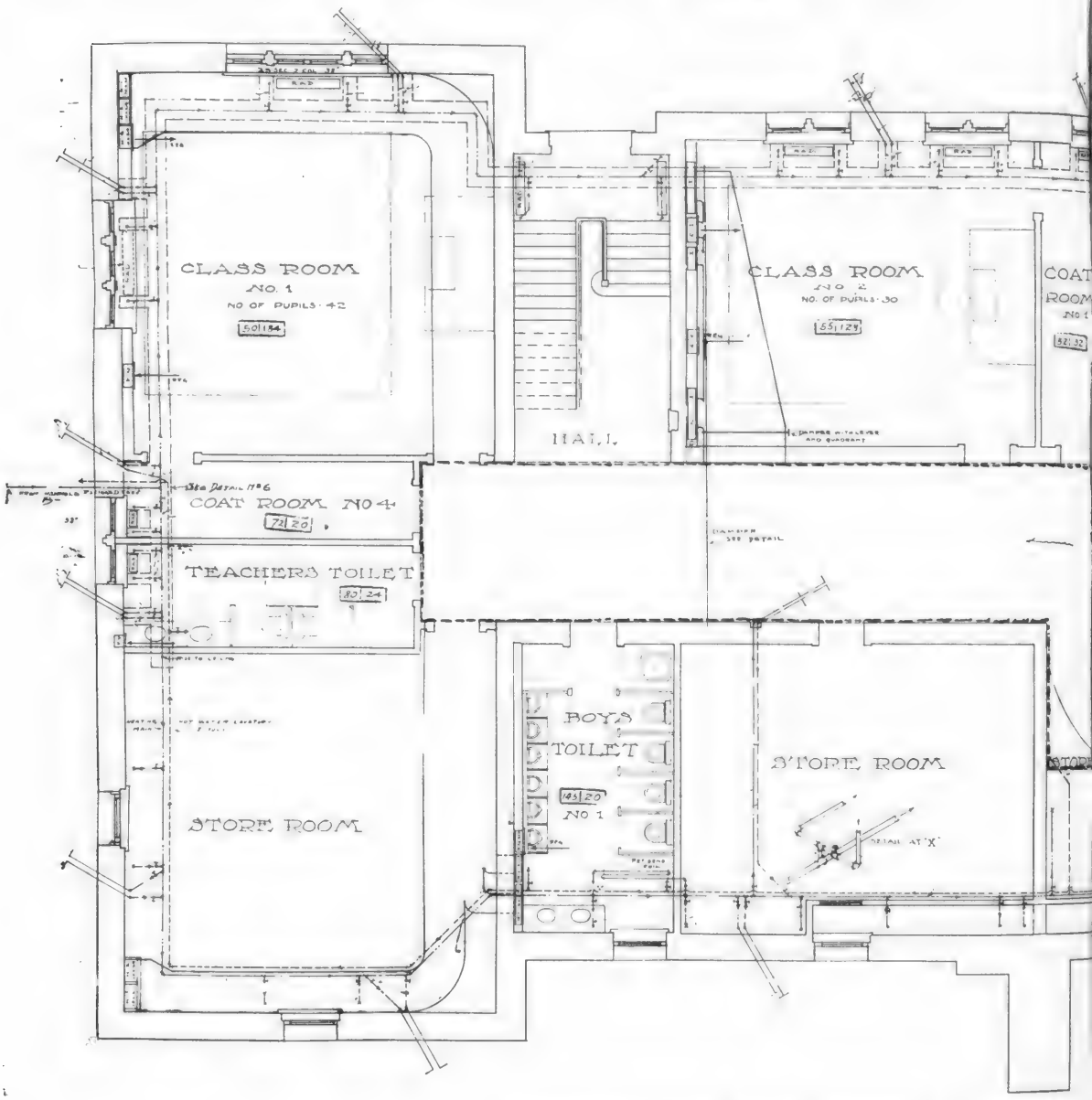
SIDE ELEVATION OF HEATING AND VENTILATING APPARATUS IN FAN ROOM OF SCHOOL BUILDING A, NEW YORK JUVENILE ASYLUM

in the circulation of the hot water. Each pump has a double suction, the water entering the disc chamber from each side, forming a balanced suction, thus doing away entirely with end thrust on the shaft. On the extended base of each pump is installed a De Laval steam turbine, to operate the pump to its maximum capacity at 100 pounds boiler pressure. The turbines are connected by gears to the pump.

The expansion tank for the hot water heaters is 4 feet in diameter and 10 feet long. It is located in the pump room in the power house where connections are made to it, both for providing for the expansion of the water in the heating system and for automatically maintaining the system full of water.

HOT WATER PIPE CONNECTIONS

Each heating pump discharges into separate mains which join and then connect first to the exhaust heater, with by-pass, thence to the auxiliary heater, with by-pass, and thence to the various buildings and under-



PLAN OF BASEMENT, SCHOOL BUILDING A, NEW YORK JU

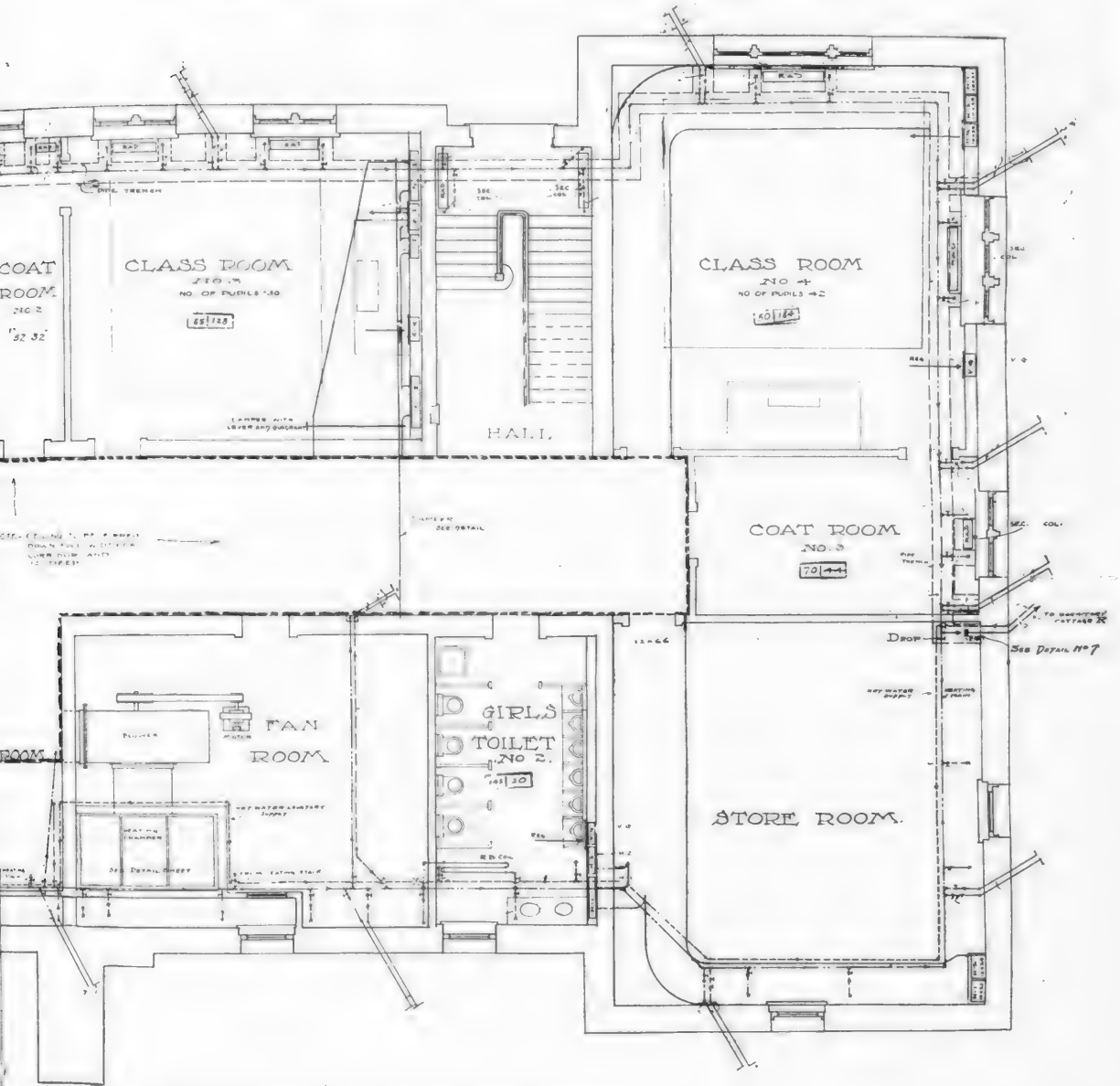
ground mains as shown in the illustrations.

The connections for the kitchen building proper are taken from the main pipe inside the wall of the kitchen building and the return connects into the main return beyond the circulating pumps.

UNDERGROUND MAIN

The heating system main starts off with supply and return mains of the same size, carried up to the manhole indicated by the letter A in the general plan of the grounds, and thence across to the opposite side of the athletic field. At this point the main divides into two branches, running in opposite directions.

The heating supply continues as indicated on the block plan, supplying the various cottages, the main supply being of the same size throughout. By reference to the block plan it will be noticed that at two points the mains are marked "Future." They will connect at a future time with 25 additional cottages.



ENILE ASYLUM, SHOWING PIPING AND VENTILATING SYSTEM

COVERING OF UNDERGROUND PIPING

All the underground piping is protected with an A. Wyckoff & Son Company hexagonal innerlined wood covering, well tarred. These pipes are underdrained with Field Tile which, at suitable points, is connected with sewers or ground drains.

At the point indicated on the detail plan of manhole A the expansion of the main is taken care of by means of iron expansion joints with brass glands. Between the expansion joints and at proper distances from corners of offsets are anchors, consisting of a piece of channel iron about 6 feet long and set at right angles to the main, to which the main is bolted and bricked in.

HOT WATER LAVATORY MAINS AND SPECIAL APPARATUS

This apparatus consists of the special heater, the circulating pump and storage tank, and the outside underground mains required for the distribution of hot water for plumbing purposes to the various buildings on the grounds. All of this apparatus is shown on the sub-basement plan of the kitchen building.

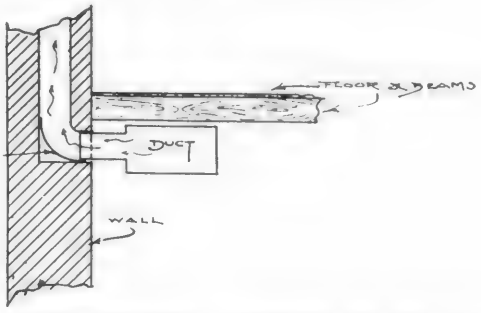
In this case, also, the apparatus and underground mains are of such capacity as to provide for the demands of the future group of buildings, already referred to.

The hot water heater is of 250 horse power, of the Goubert make. The storage tank is 5 feet in diameter by 10 feet long. The coil inside the tank for heating the water by live steam is of 1¼-inch brass pipe. The circulating pump for inducing and maintaining a circulation through the underground hot water mains is a De Laval steam turbine pump. For the purpose of filling the stand pipe and the necessary water suction a 7½ x 7 x 10-inch duplex plunger pump is used.

An additional 2-inch high pressure steam connection is made to the coil in the tank for the purpose of maintaining the necessary temperature of the water when there is insufficient exhaust steam for this purpose. The temperature of the water is regulated by a Davis & Roesch hot water thermostat, inserted in the pipe just before it leaves the building, and controlling the live steam inlet to the coil in the storage tank.

HOT WATER MAINS.

The main hot water pipe is carried from the feed water heater to the storage tank, thence to the pump where a main is then carried out of the building up to the manhole at the point marked A on the block plan, and is then extended around to supply the various buildings. This main gradually reduces in size as connections are taken off for the buildings, until it reaches the minimum size of

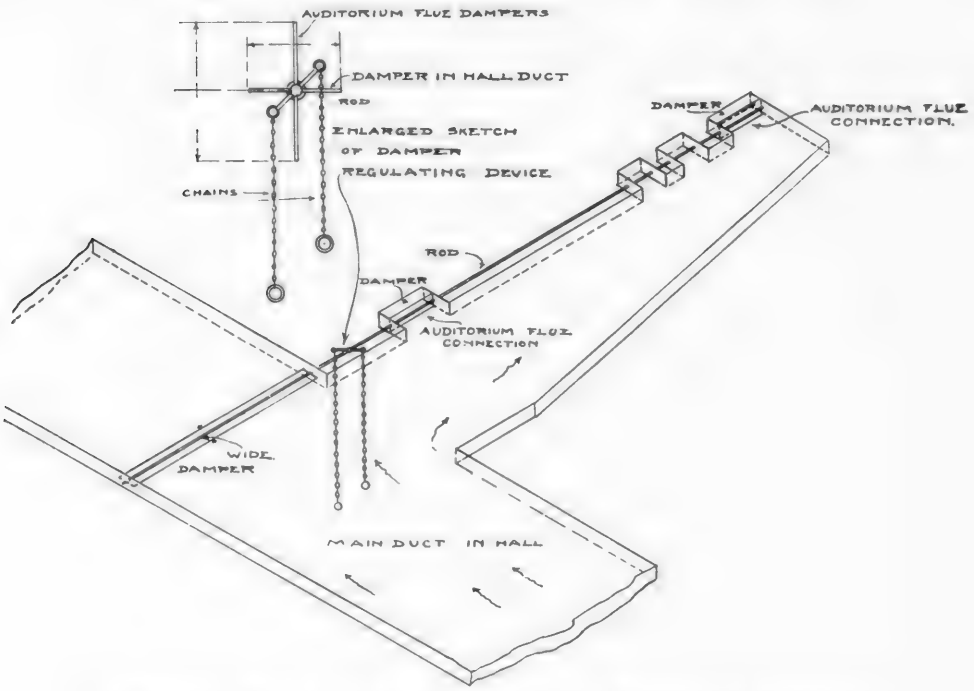


SKETCH OF TYPICAL CONNECTIONS OF MAIN DUCT TO VERTICAL FLUES, SCHOOL BUILDING A

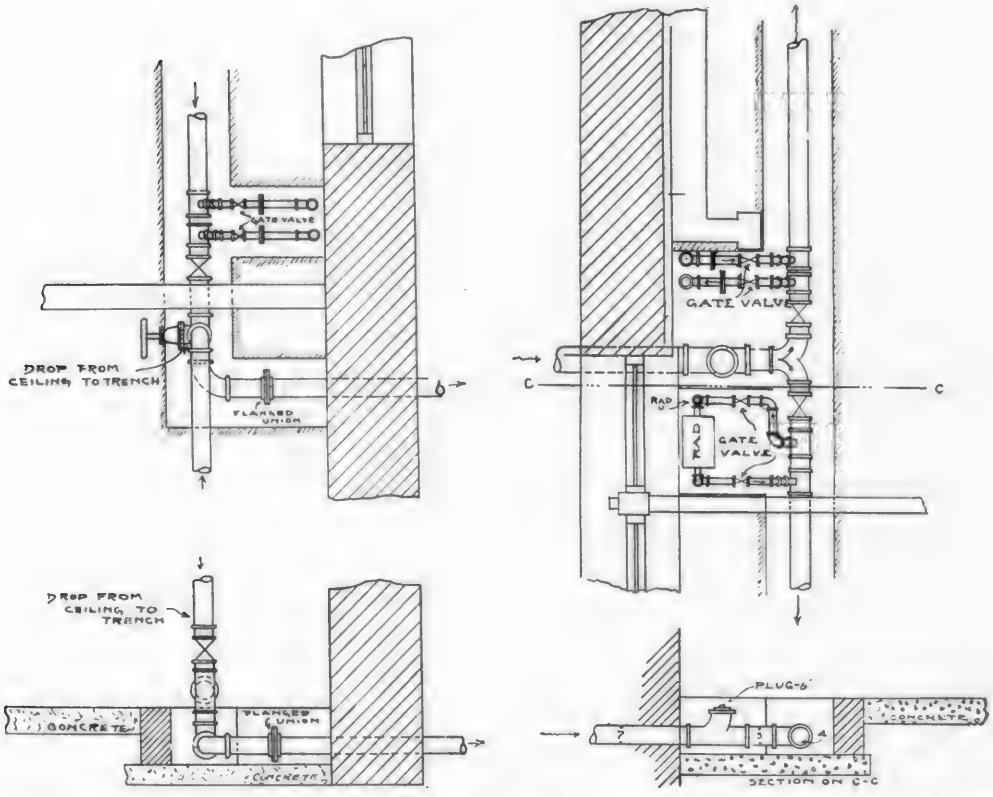
2 inches. The hot water supply main is then continued 2-inch from a point midway between the two school buildings back to the power house, for the purpose of keeping a continuous circulation through the lavatory supply pipe, so that at any time hot water may be obtained in any of the buildings.

HEATING OF KITCHEN BUILDING

The heating of the various buildings is by direct radiation, the general arrangement of the piping being shown on the basement plans of the kitchen building, the school building, and the two types of cottages. In the school building, however, a ventilating system is installed for ventilating purposes only, and designed to be in operation only when the rooms are occupied. This system consists of a 140-inch blower, steel-plated, full-housed, top-discharge fan, operated by a 20 horse power direct current belted motor for operating

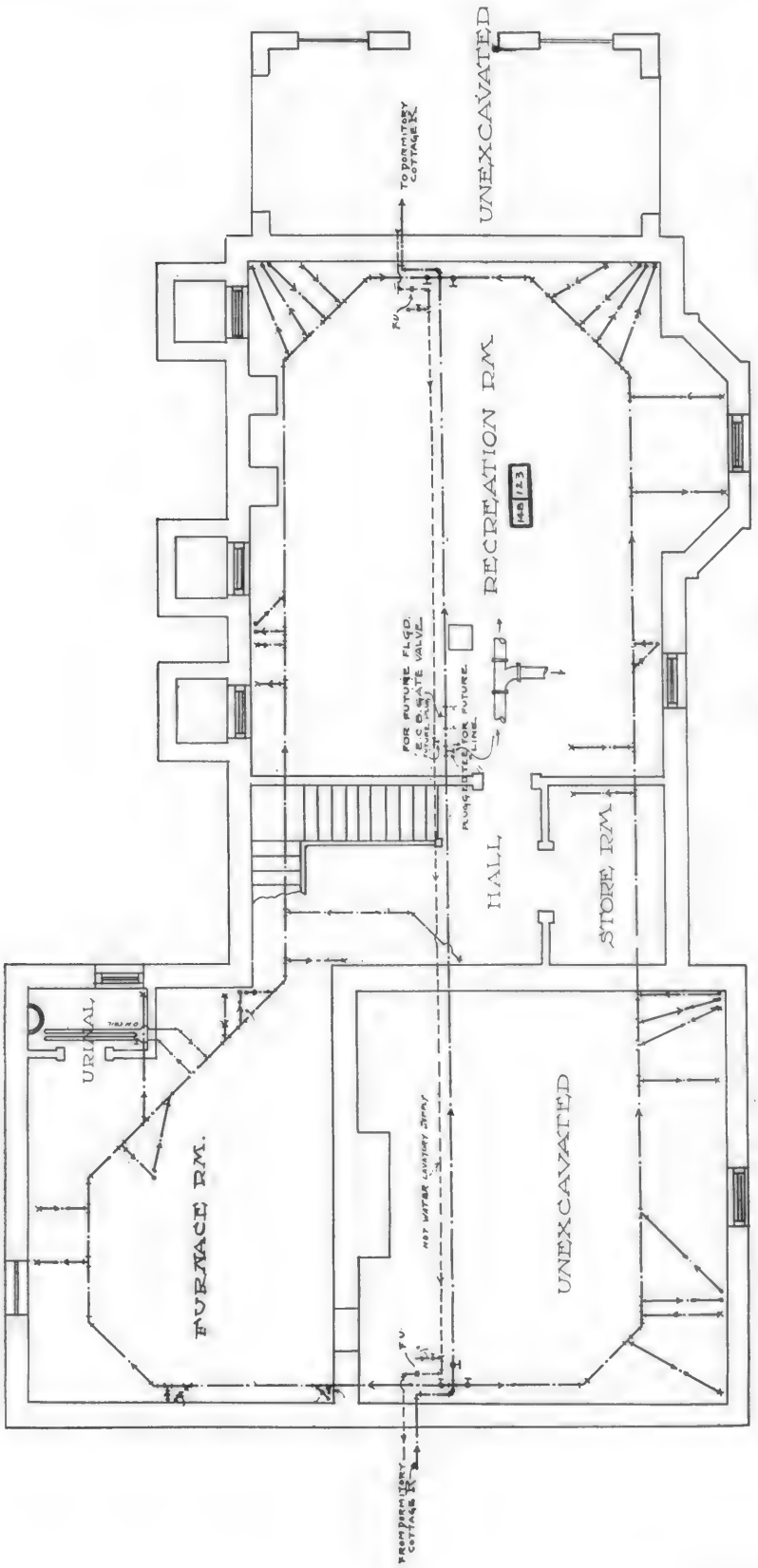


ISOMETRIC SKETCH SHOWING DAMPERS AND METHOD OF OPERATION

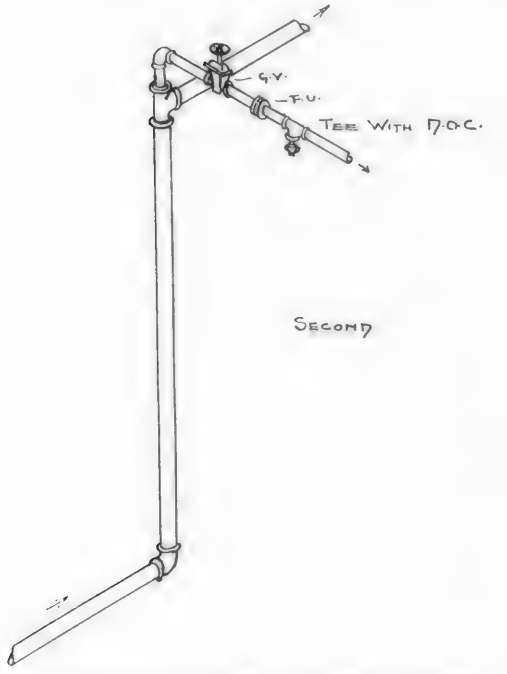


DETAIL NO. 7 OF PIPING IN STORE ROOM DETAIL NO. 6 OF PIPING IN COAT ROOM NO. 4

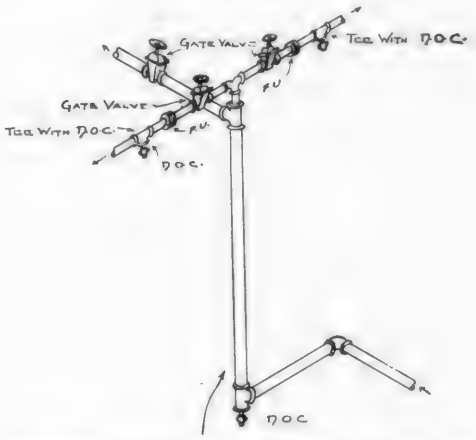
VENTILATING AND PIPING DETAILS IN SCHOOL BUILDING A, NEW YORK JUVENILE ASYLUM



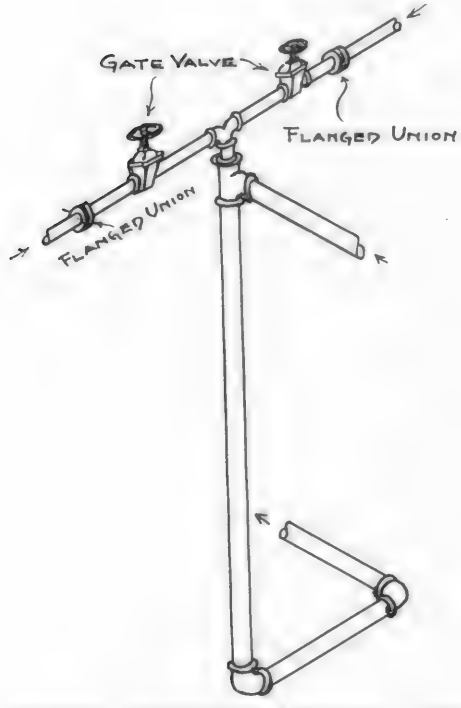
BASEMENT PLAN OF ONE OF THE SINGLE ROOM COTTAGES (COTTAGE P), NEW YORK JUVENILE ASYLUM, SHOWING PIPING



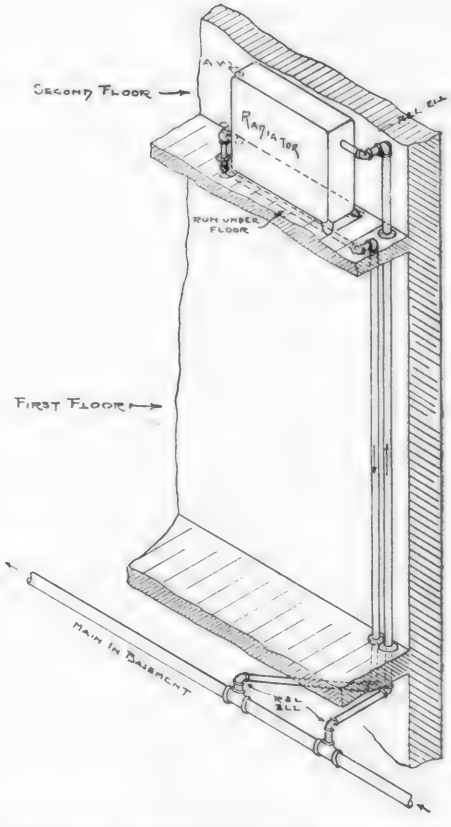
HEATING CONNECTIONS AFTER ENTERING BUILDING



HEATING CONNECTIONS AFTER ENTERING BUILDING



HEATING CONNECTIONS ABOUT TO LEAVE BUILDING



SHOWING CONNECTION TO SECOND-FLOOR RADIATOR

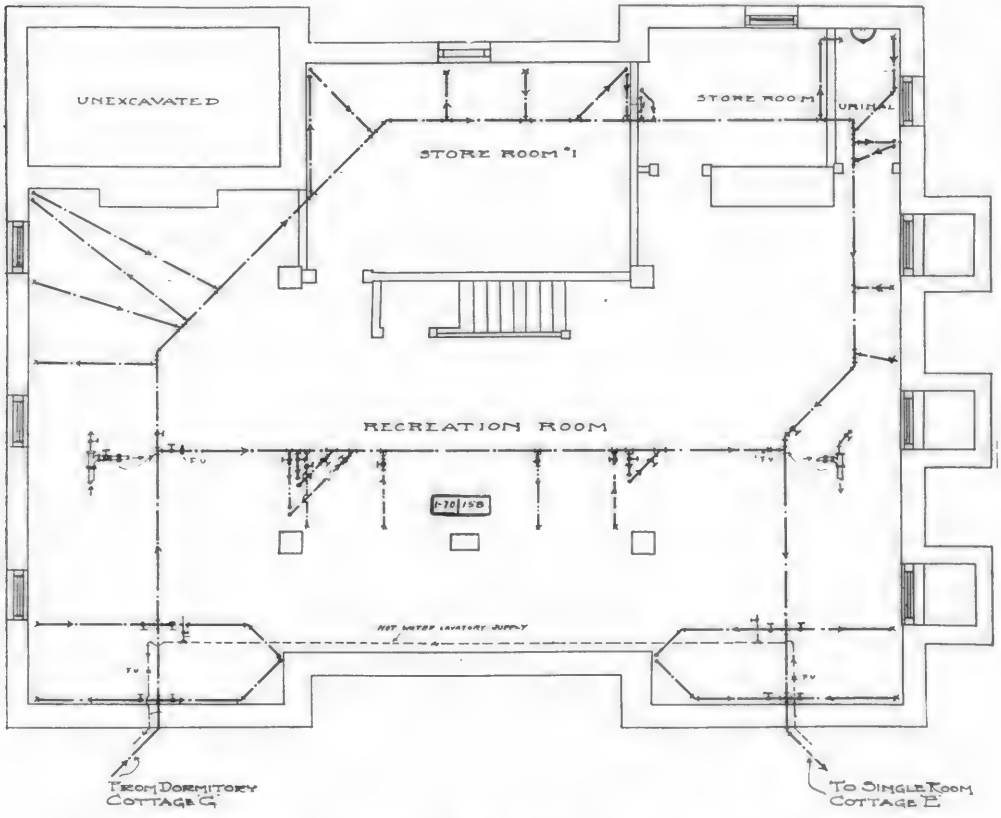
DETAILS OF HEATING CONNECTIONS IN DORMITORY COTTAGE, NEW YORK JUVENILE ASYLUM

the blower at a speed of 200 R.P.M. The main air duct is located in the basement hallway and the vertical air and vent flues are formed by means of partition blocks and metal lath and plastering, so that no galvanized iron flues are used at such points, with a few exceptions. These exceptions are the connection from the fan to the furred down space in the basement hall and also the five connections from the hallway to the five series of vertical flues. The vent flues all terminate in the attic.

The central heating stack for tempering the air delivered through the ventilating system is made of Cardinal indirect radiators. The stack is divided into three divisions, one above the other, and sub-divided into six groups, so that no one group contains more than 13 sections. A special riser connection is taken from the main pipe to supply the indirect heating stack.

The architects for the New York Juvenile Asylum are York & Sawyer, of New York, and the designers and contractors for the power plant and heating system are Evans, Almirall & Company, New York.

Many persons who admit the necessity of supplying a large quantity of air for ventilation fail to appreciate the importance of the work done by the ventilating duct or chimney. While they acknowledge the good work done by an open fireplace in removing foul air from a room, they apparently do not appreciate the fact that the fireplace takes the air from the bottom of the room. The ventilating duct opening from the bottom of the room works in the same way, and when properly located will do the work with far less expenditure of fuel than the open fireplace.



PLAN OF BASEMENT OF ONE OF THE DORMITORY COTTAGES (COTTAGE F), NEW YORK JUVENILE ASYLUM, SHOWING PIPING

British Institution of Heating and Ventilating Engineers

At the British Institution's recent meeting in London, President W. Nelson Haden was re-elected. The other officers for the ensuing year are: Vice-presidents, J. B. Simpson, C. I. Haden, W. Yates and J. D. Sutcliffe; secretary, Arthur Taylor (re-elected); treasurer, Edward Taylor (re-elected); members of the council, A. H. Barker, C. Mason, C. F. Seward, J. G. Walker, H. H. Grundy, Walter Jones, C. R. Honiball, C. Barker, H. S. Moorwood and R. E. Atkinson. Among the new members who qualified was Pierre Gustave Debesson, of Paris, who is also a member of the American Society. The secretary's report showed the membership to be 192, honorary members 2, life members 7, associate members 72, graduate 1, making a total of 274.

It was voted that the best two papers read during 1906 were Mr. A. H. Barker's paper on "Calorimetrical Methods of Determining Heat Losses from Buildings and Radiators" (published in THE HEATING AND VENTILATING MAGAZINE for February, 1906), and Mr. C. R. Honiball's paper on "The Warming of Steamships" (published in the August and September issues of THE HEATING AND VENTILATING MAGAZINE.

The council recommended that the summer meeting be held June 25-26 at Windsor, in which case arrangements will be made for an inspection of the State apartments at Windsor Castle.

National Association of Brass Manufacturers

The National Association of Brass Manufacturers met at Cleveland, Ohio, April 8 and 9 last. The following day, through the efforts of the Detroit Manufacturers' Association, a joint meeting of the brass interests was held to take up matters relating to all branches of the brass trade.

NATIONAL ASSOCIATION OF MASTER STEAM AND HOT WATER FITTERS

Meeting of Indiana State Association

The fourth annual convention of the Indiana State Association of Master Steam and Hot Water Fitters was held at the Claypool Hotel, Indianapolis, March 19. President James M. Healy was in the chair.

President P. Gormly, of the National Association of Master Steam and Hot Water Fitters, and Secretary Henry B. Gombers were present during the sessions and addressed the members. President R. B. Moodie, of the National Association of Master Plumbers, was a guest of honor, and in an address to the convention urged a closer relation between the two branches of the trade represented by the two associations.

The much-discussed matter of the manufacturer compensating the steam fitter for his time and other expenses in replacing any defective material was put in the form of a resolution and passed. The following officers were elected for the ensuing year: President, H. H. Highlands, Muncie; vice-president, A. E. Werkhoff, Lafayette; secretary, J. A. Gallivan, Muncie; treasurer, P. J. Freaney, Indianapolis.

Annual Meeting of the New York State Association.

The thirteenth annual meeting of the New York State Association will be held in New York City, May 2, 1907.

New Officers for New York City Association.

The following officers have been elected to serve during the ensuing year: President, Charles N. Brisze; vice-president, U. G. Scollay; treasurer, Wm. G. Baldwin, Jr.; board of directors: Charles N. Brisze, U. G. Scollay, Wm. J. Baldwin, Jr., and Joseph G. Geoghegan.

Annual Meeting of Newark Association

The following officers were elected at the annual meeting of the Newark Association of Master Steam and Hot Water Fitters, held at Davis's Restaurant, March 19: President, William A. Dunn; vice-president, Walter A. Lawson; secretary, Sol Berla; treasurer, William M. Whitlock; member of executive committee, Edward R. Soleau. The officers reported that no labor troubles existed in the local trade and that the business outlook for the season was good.

San Francisco Local Association Organizes

The master fitters of San Francisco have organized a local association with the following officers: President, J. G. Sorgen; vice-president, H. Moffitt; treasurer, J. G. Sutton; secretary, W. Wetherell; executive committee, Frank Lyman, A. Kuster and F. Wilson.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

Illinois Chapter Incorporates

The Illinois chapter of this society, organized during the past year, has been incorporated by Messrs. T. J. Waters, N. L. Patterson and John F. Hale.

THE HEATING AND VENTILATING MAGAZINE

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"NOTES for the Committee on Standards," is the title of a collection of heating data prepared by Professor William Kent and offered to The American Society of Heating and Ventilating Engineers as a basis upon which to establish standards for heating calculations which can be adopted by the society. The data might well be called "Notes from a Heating Engineer's Handbook" for they contain many handy and valuable rules for calculation and tables of reference which are not to be found elsewhere in such compact form, while many of the data are entirely original, having been worked out for his own use from time to time by Professor Kent.

The subjects covered in the data are: (1) steam boiler efficiencies, including also heating values of coal, (2) heat transmission, (3) heating by hot air furnaces, carrying capacity of air pipes and volume and density of air at different temperatures and (4) grate surface and rate of burning coal. In this issue will be found all of these notes with the exception of those relating to heating by hot air furnaces, which will appear in our May issue.

Professor Kent desires the fullest criticism of his notes, also suggestions for additions to them, in order that the Committee on Standards may have as many data before it as possible when it begins to prepare a final report on the subject, to be presented at the next annual meeting of the Society.

THE manner in which the Legislators of Wisconsin are looking after the welfare of their constituents in the heating trade is worthy of notice. A bill recently introduced in the Legislature of that State prescribes a 65-degree Fahrenheit minimum temperature in the heating of the interurban trolley cars throughout Wisconsin. The electric railway companies, in opposing the proposed legislation, state that it will be impossible at times to comply with the requirement. Another bill of the same character provides for the heating of the platforms of trolley cars. This is opposed by the transportation companies as being impracticable, for the reason that the apparatus would obstruct the vision of the motorman and thus interfere with the safe operation of the car. The possibilities opened up by this kind of legislation are enough to cause the stoutest corporation heart to quail.

MANUFACTURERS of heating apparatus have long since discovered the field that has opened to them through the education of farmers to the use of steam and hot water as heating mediums on their farms. It is true that up-to-date farmers, in increasing numbers, are taking up this method of heating, just as they have taken up the telephone and other modern conveniences. The farmers of South Dakota, however,

have gone a step farther in this direction than any that has come to our notice. According to news reports, they have formed an association to establish a central power plant, which will supply them with light, heat and power for an area of several miles. With such a power plant it is proposed to do the plowing, sowing, reaping and thrashing, by electricity.

IN connection with the use of superheated steam for heating purposes an important consideration has been advanced by Mr. R. P. Bolton, who says, in a recent article on the subject, that the construction of radiators will have to be altered materially to obtain the most economical results with superheated steam. The important features of this change of construction will be the great reduction of the annular or interior spaces in the radiating apparatus to procure not only less depth of vapor but also a more active circulation of the steam.

CONTRACTORS who are not accustomed to doing city work will take note of the dilemma in which a prominent heating firm in Fargo, North Dakota, found itself recently in the course of some work being done for the city of Moorhead, Minn. The contract, which provided for the necessary steam fittings to connect two boilers in a power house to the engines, called for the signature of several parties, including those of the Mayor and clerk of Moorhead. Drafts of the contract were given to the heating concern which, after executing them, returned them to the City Clerk of Moorhead. When they were presented to the Mayor, however, he refrained from signing them on the ground that the city council had not authorized him to sign such a contract. In the meantime, work was started by the heating contractor and only when it was near completion was the discovery made that the contract still lacked the Mayor's signature. It now appears that the bids when opened were not submitted to the council, as required by the charter, and that the council's only action in the matter had been to grant a requisition to cover the work, thus enabling one of the city's commissions to advertise for bids.

REFERRING again to Prof. Albert J. Henry's recent discussion of the weather from a scientific point of view, which we commented upon in a recent issue, one of his interesting statements was in connection with the fact that fully 90 per cent. of the storms that appear in one portion or another of the United States have their origin west of the Mississippi River. A very large proportion of the storms in the United States come east from the North Pacific coast and pass out of the country by way of the lower lake region and the St. Lawrence valley. Another large group, prominent in the colder months, have their origin in the Eastern Rocky Mountains. Still another group, most numerous in the spring and fall months, are called Arizona Lows, some of which move northeast to the lake region, while others take a due easterly course to the West Gulf coast, thence northeastward to the St. Lawrence valley, via the Ohio valley, or due eastward along the Gulf coast, passing off to sea over Florida. Comparatively few storms originate in the Mississippi valley, over the Gulf of Mexico or south of Florida.

Notes From a Heating Engineer's Handbook

Proposed Standards for Heating Calculations Prepared by Prof. William Kent for the Committee on Standards, American Society of Heating and Ventilating Engineers

It is highly desirable that the members of our society should agree, as far as possible, on standard methods of figuring the quantities of heat to be supplied in heating and ventilating, assumed heating values of coal, amounts of grate surface, heating surface and radiating surface, quantities of air to be supplied under different circumstances, allowances to be made for exposures, etc., and standard formulas and constants to be used in all systematic calculations.

These formulas and constants should, as far as possible, be based on the fundamental principles and well-known laws of physics, and should take the form of logical or rational formulas, rather than rules of thumb. Rules of thumb are exceedingly convenient for rapid calculations, but they are not well adapted to a variety of conditions, and their use should be discouraged as far as possible in our transactions, although it is perfectly proper for short cuts, which appear to be rules of thumb, to be used whenever they are based upon known conditions and are made by inserting into the logical formula constants representing those known conditions and making short formulas therefrom.

The accompanying notes are submitted for the purpose of having them criticised, with a view to eventually leading to a series of standard notes which may be incorporated in our transactions after they have been thoroughly studied and amended and added to, if necessary. It is the desire of the writer that they be passed on by the committee for publication and distributed among the members, inviting the fullest criticism.

Steam Boiler Efficiency

The maximum efficiency obtainable with anthracite in low pressure steam boilers, water heaters or hot air furnaces is about 80 per cent., when the thickness of the coal bed and the draft are each such as to cause enough air to be supplied to effect complete combustion of the carbon to CO_2. With coals high in volatile matter the maximum efficiency is probably not over 70 per cent. Very much lower efficiencies than these figures are obtained when the air supply is either deficient or greatly in excess.

AVAILABLE HEATING VALUE OF THE COAL

Using the figure given in the last column as the average heating value of coal stored in a dry cellar, we have the following as the probable maximum values in British thermal units, the heat available for furnishing steam or heating water or air, for the efficiencies stated.

	Anth.	Semi-anth.	Semi-bitum.	Bitum., East.	Bitum., West.	Lig.
Efficiencies	.80	77	75	70	65	60
	10,080	9,933	10,837	9,275	6,760	5,820

Eastern bituminous coal is that of the Appalachian coal field extending from Pennsylvania and Ohio to Alabama. Western bituminous coal is that of the great coal fields west of Ohio.

The value, 10,000 B.T.U., is usually taken as the figure to be used in calculation for design of heating and ventilating apparatus, and this will be taken as the standard in the calculations which follow.

HEAT TRANSMISSION IN B.T.U. PER SQUARE FOOT PER HOUR PER DEGREE OF DIFFERENCE OF TEMPERATURE

BRICK WALLS

Thickness, Inches.	Wolff.	Hauss.	Average.* B.T.U.
4	0.66	...	0.537
4¼	...	0.48	0.508
8	0.45	...	0.397
10	...	0.34	0.351
12	0.33	...	0.313
15	...	0.26	0.272
16	0.27	...	0.260
20	0.23	0.22	0.222
24	0.20	...	0.194
25	...	0.18	0.188
28	0.18	...	0.172
30	...	0.16	0.163
32	0.16	...	0.154
35	...	0.13	0.143
36	0.145	...	0.140
40	0.13	0.12	0.128
45	...	0.11	0.116

SOLID SANDSTONE WALLS

(Hauss.)

Thickness. Inches.	B.t.u.	Thickness. Inches.	B.t.u.
12	0.45	32	0.26
16	0.39	36	0.24
20	0.35	40	0.22
24	0.32	44	0.20
28	0.29	48	0.19

For limestone walls, add 10 per cent.

GLASS SURFACES

	Wolff. B.t.u.	Hauss. B.t.u.
Vault light	1.42	...
Single window	1.20	1.00
Double window	0.56	0.46
Single skylight	1.03	1.06
Double skylight	0.50	0.48

*The average figure for brick walls was obtained by plotting the reciprocals of Wolff's and Hauss' figures and drawing a straight line between them, representing the average heat resistances, and then taking the reciprocals of the resistances for different thicknesses. The resistance corresponds to the straight line formula: B.t.u. $= 1.2 + 0.165\ l$, where l = thickness in inches.

HEATING VALUE OF COAL

	Volatile matter in the combustible. per cent.	Heating value per pound combustible.	Moisture in air dried coal. Average	Moisture in air dried coal. Per cent.	Ash in air dried coal. Per cent.	Av. heating value of air dried coal. B.t.u. per pound
Anthracite	3 to 7.5	14,700 to 14,900	14,800	0.5 to 1.0	10 to 18	12,600
Semi-anthracite	7.5 to 12.5	14,900 to 15,500	15,200	0.5 to 1.0	10 to 18	12,950
Semi-bituminous	12.5 to 25.0	15,500 to 16,000	15,750	0.5 to 1.0	5 to 10	14,450
Bituminous, Eastern	25 to 40	14,800 to 15,500	15,150	1 to 4	5 to 15	13,250
Bituminous, Western	35 to 50	13,500 to 14,800	14,150	4 to 14	10 to 25	10,400
Lignite	Over 50	11,000 to 13,500	12,250	10 to 18	5 to 25	9,700

DOORS

	Wolff.	Hauss.
1-in. pine	0.40	0.40
2-in. pine	0.28	...

PARTITIONS

Solid plaster	1¾	2¼	0.60
	2½	3¼	0.48
Fireproof		0.30	...
2-in. pine board		0.28	...

FLOORS

	Hauss.
Joists with double floor	0.10
Concrete floor	0.31
Concrete floor on brick arch	0.22
Stone floor on arches	0.20
Planks laid on earth	0.16
Planks laid on asphalt	0.20
Arch with air space	0.09
Stones laid on earth	0.08

CEILINGS

	Hauss.
Joist with single floor	0.10
Arches with air space	0.14

ALLOWANCES FOR EXPOSURES

Wolff adds 25 per cent. for north and west exposures, 15 per cent. for east, and 5 per cent. for south exposures, also 10 per cent. for reheating and 10 per cent. for the transmission through floor and ceilings. Hauss makes allowances as follows:

Add 5 per cent. for rooms with unusual exposure.

Add 10 per cent. where exposures are north, east, northeast, northwest and west.

Add 3⅓ per cent. where the height of ceiling is more than 13 ft.

Add 6⅔ per cent. where the height of ceiling is more than 15 ft.

Add 10 per cent. where it is more than 18 ft.

For rooms heated daily, but where heating is interrupted at night, add

$$A = \frac{0.0025\ (N—I)\,W_1}{Z}$$

RATED CAPACITY OF FURNACES AND BOILERS FOR HOUSE HEATING

Diameter of round grate ins.	Area in sq. in.	Area in sq. ft.	Coal burning capacity per hour lbs.	(a) Capacity B. T. U. per hour.	(b) Equiv. lbs. steam evap. 212° per hour	(c) Equiv. lbs. air per hr. heated 100°	(d) Equiv. cu. ft. air at 62° heated 100°
12	113.1	.785	3.142	31,420	32.5	1,320	17,350
14	153.9	1.069	4.276	42,760	44.3	1,797	23,610
16	201.1	1.396	5.585	55,850	57.8	2,347	30,840
18	254.5	1.767	7.069	70,690	73.2	2,970	39,030
20	314.2	2.182	8.728	87,280	90.4	3,667	48,190
22	380.1	2.640	10.560	105,600	109.4	4,437	58,300
24	452.4	3.142	12.566	125,660	130.1	5,280	69,380
26	530.9	3.687	14.748	147,480	152.7	6,197	81,430
28	615.8	4.276	17.104	171,040	177.1	7,187	94,440
30	706.9	4.909	19.636	196,360	203.3	8,260	108,420
32	804.2	5.585	22.340	223,400	231.3	9,387	123,350
34	907.9	6.305	25.220	252,200	261.2	10,597	139,260
36	1017.9	7.069	28.276	282,760	292.8	11,881	156,120

Figures in column b = a ÷ 965.7.
Figures in column c = a ÷ (100 × 0.238).
Figures in column d = c × 13.141 = a × 0.55214.
Latent heat of steam at 212 degrees = 965.7 B.T.U.
Specific heat of air = 0.238.

Note that the figures in the last three columns are all based on the rate of combustion of 4 lbs. of coal per sq. ft. of grate per hour, which is taken as the standard for house heating. For heating school-houses and other large buildings where the furnace is fed with coal more frequently a much higher actual capacity may be obtained from the grate surface named.

For rooms not heated daily, add

$$B = \frac{0.1\ W\ (8\text{-}Z)}{Z}$$

In both these formulas, W_1 = B. T. U. lost per hour by exposed surfaces; W = total B. T. U. necessary, including that for ventilation or changes of air; N = time from cessation of heating to time of starting fire again, in hours; Z = time necessary after fire is started until required room temperature is reached, in hours.

Grate Surface and Rate of Burning Coal

In steam boilers for power plants, which are constantly attended by firemen, coal is generally burned at between 10 lbs. and 30 lbs. per sq. ft. of grate per hour. In small boilers, house heaters and furnaces which even in the coldest weather are supplied with fresh coal only once in several hours, it is necessary to burn the coal at very much slower rates. Taking a cubic foot of coal as weighing 60 pounds, in a bed 12 inches deep, and 1 sq. ft. of grate area, it would be one-half burned away in 7½ hours at a rate of burning of 4 lbs. per sq. ft. of grate per hour. This figure, 4 lbs., is commonly taken in designing grate surface for house heating boilers and furnaces and it is advisable to adopt it as a standard. Using this figure we have the following as the rated capacity of different areas of grate surface.

Heating Surface

For power plant steam boilers, practice shows that about 10 sq. ft. of heating surface is required to give 1 boiler H. P. (34½ lbs. water evaporated per hour from and at 212°) with good economy of fuel or 1 sq. ft. for every 3.45 lbs. water evaporated, or $(3.45 \times 965.7) = 3331.7$ B. T. U. transmitted through the heating surface.

The lower temperature of the water in a low pressure steam boiler should give a more rapid rate of transmission through the heating surface, but to offset this we have in house heating boilers a lower furnace temperature due to the chilling effect of a greater area of heating surface in the fire box exposed to direct radiation relative to the quantity of coal burned per hour. Assuming these effects to balance each other, we would have for the proportions of heating surface of a house heating boiler the same figure as for power boilers. Viz., for good economy 1 sq. ft. heating surface should transmit 3331.7 B. T. U. per hour. Since the available B. T. U. per sq. ft. grate is 40,000, we have ratio of heating to grate surface, $\frac{40{,}000}{3331.7} = 12.0$

This is only for a rate of burning of 4 lbs. of coal per sq. ft. of grate per hour. For any other rate of burning the heating surface should be proportionately increased. Thus for an 8-lb. rate the ratio of heating to grate surface should be 24.

The same proportions may be taken for hot water heating as for steam heating.

For cast iron boilers and heaters, the difference in comductivity as compared with steel is probably not enough to warrant a different rule for proportioning.

For hot air furnaces, sufficient systematic experiments have not been recorded upon which to base any rule for proportioning heating surface.

The process of drying is only an exaggerated case of heating in which the temperature to be maintained greatly exceeds that required in a well-ventilated room. A supply of air sufficient to change the volume once in 8 to 15 minutes in the ordinary structure is all that is necessary to meet the conditions of good heating and ventilation, but a supply equivalent to a complete change in the free spaces within the dry-room 60 or more times per hour is required in the lumber dry kiln. The temperature therein will range up to 150° or more.

CAPACITY OF 1 SQ. FT. AND OF 100 SQ. IN. OF GRATE SURFACE, FOR STEAM, HOT WATER, OR FURNACE HEATING

(Based on burning 4 lbs. of coal per sq. ft. of grate per hour and 10,000 B.T.U. available heating value of 1 lb. of coal).

1 sq. ft. grate equals	100 sq. ins. grate equals	
4.	2.775	lbs. of coal per hour.
40,000.	27,750.	B.T.U. per hour.
41.42	28.70	lbs. of steam evap. from and at 212 degrees per hour.
156.5	108.7	sq. ft. of steam radiating surface = B.T.U ÷ 255.6 (a).
261.4	181.5	sq. ft. of hot water radiating surface = B.T.U. ÷ 153 (b).
22,086.	15,337.	cu. ft. of air (measured at 62 degrees F.)per hour heated 100 degrees.

(a) Steam temperature 212°, room temperature 70°, radiator co-efficient 1.8.
(b) Water temperature 160°, room temperature 70°, radiator co-efficient 1.7.
For any other rate of combustion than 4 lbs., multiply the figures in the table by that rate and divide by 4.

The Weather During March

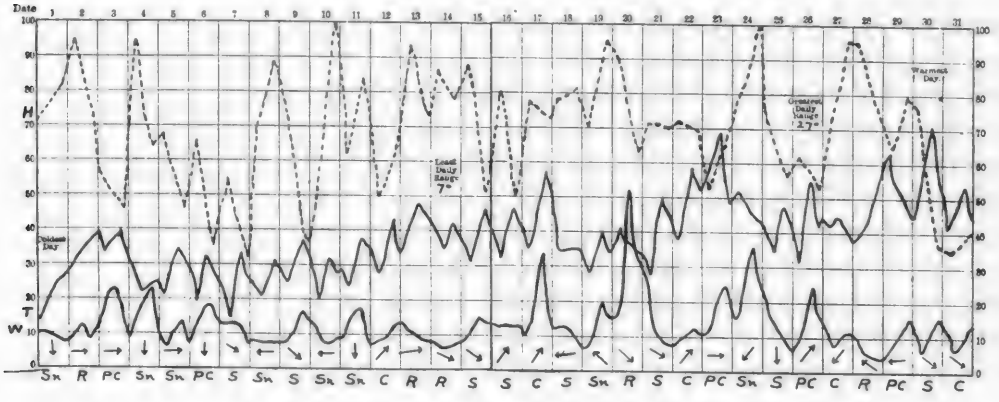
March of 1907 will go down in history as an unusually warm month. From all cities from which we receive weather reports, the temperature for this month averaged above the ordinary, in some cases nearly equaling all previous records. In St. Louis, for instance, where the mean temperature for the month was 53°, these figures have been surpassed but once, in 1878, when a mean temperature of 54° was recorded. The next warmest city was Chicago, which beat all records since 1878. Boston's, Pittsburg's and New York's records for March were eclipsed in 1903.

BOSTON

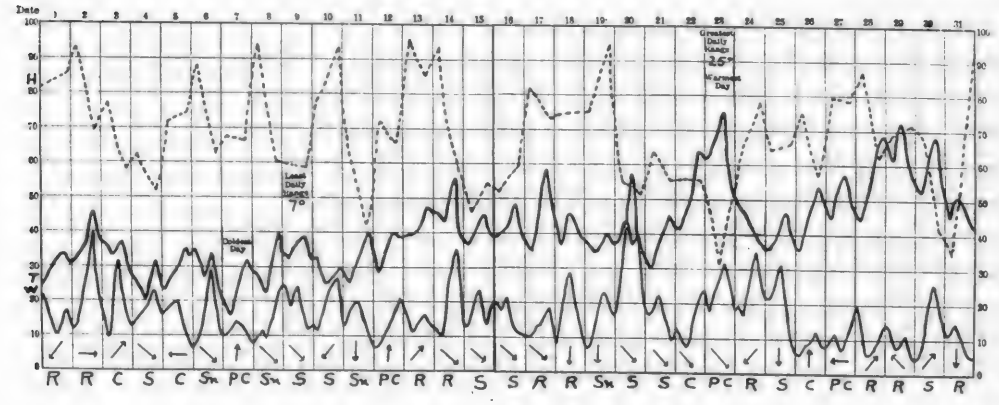
In Boston, during March, the highest temperature recorded was 71° on the 30th, and the lowest temperature, 14° on the 1st. The greatest daily range was 27° on the 26th and the least daily range, 7° on the 14th. The month was unusually warm, the mean temperature being 38°, or nearly 3° above the average for 37 years. 1.66 inches of rain and 6.6 inches of snow fell during the month. The greatest precipitation in any one day was 0.41 inches on the 2nd. There was no snow on the ground at the end of the month. The prevailing direction of the wind was northwest and the total wind movement, 8,201 miles; average hourly velocity, 11 miles; maximum velocity for five minutes, 52 miles per hour from the northwest on the 20th. There were 11 clear days, 6 partly cloudy and 14 cloudy. Rain fell on 12 days.

NEW YORK

In New York, the highest temperature during March was 75° on the 23d, and the lowest, 16° on the 7th. The greatest daily range was 25° on the 23rd, and the least daily range, 7° on the 9th. The mean temperature for the month was 41°, which is 3° above the average for 38 years. The total rainfall was 3.80 inches, and the snowfall, 13.8 inches. The greatest rainfall in any one day was 1.03 on the 19th. There was no snow



RECORD OF THE WEATHER IN BOSTON FOR MARCH, 1907



RECORD OF THE WEATHER IN NEW YORK FOR MARCH, 1907

Upper black line indicates temperature in degrees Fahr.
Dotted line indicates relative humidity in percentage
Lower black line indicates velocity of wind in miles per hour
Arrows fly with prevailing direction of wind.
S—Clear. PC—Partly Cloudy. C—Cloudy. R—Rain. Sn.—Snow

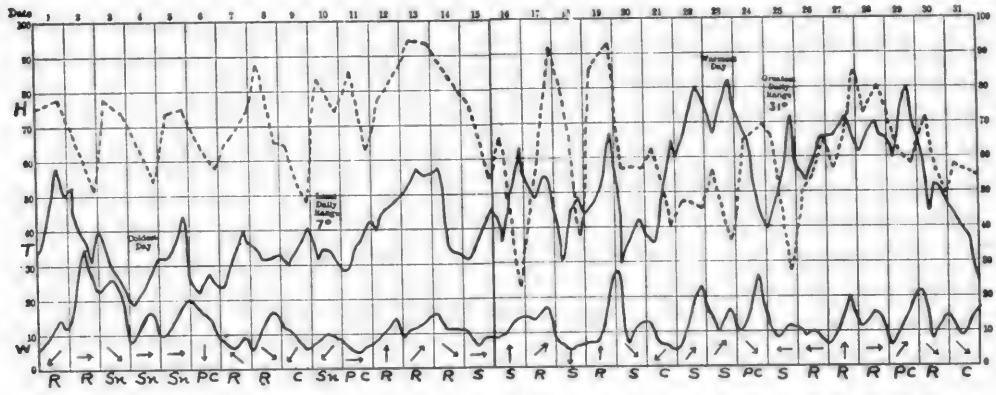
on the ground at the end of the month. The prevailing direction of the wind was northwest and the total movement, 8,813 miles. The average hourly velocity of the wind was 11.8 miles; maximum velocity for five minutes, 58 miles per hour from the northwest on the 20th. There were 10 clear days, 10 partly cloudy, and 11 cloudy. There were 15 days on which rain fell.

PITTSBURG

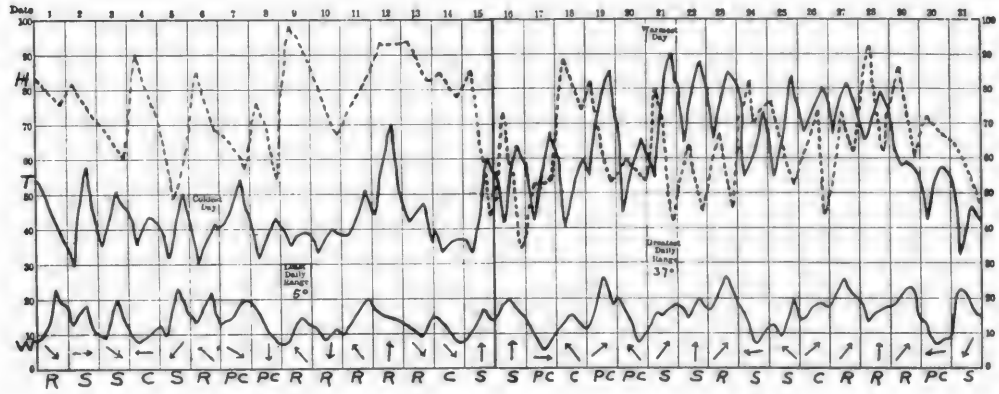
In Pittsburg, during March, the highest temperature was 81° on the 23rd, and the lowest, 18° on the 4th. The greatest daily range was 31° on the 25th and the least daily range 7° on the 10th. The month was warmer than usual, the mean temperature being 46°, 6° above the average for 37 years. 5.24 inches of rain fell during the month and 4.6 inches of snow. The greatest precipitation in any one day was 1.71 inches on the 12-13th. There was no snow on the ground at the end of the month. The north wind was the prevailing wind and the total movement, 8,586 miles; average hourly velocity, 11.5; maximum velocity for five minutes, 54 miles per hour from the northwest on the 2nd. The month had 7 partly cloudy days, 8 cloudy, 7 clear days, 8 partly cloudy and 16 cloudy. Rain fell on 19 of these days.

ST. LOUIS

In St. Louis, during March, the highest temperature was 90° on the 21st, and the lowest, 30° on the 6th. The greatest daily range was 37° on the 21st, and the least daily range, 5° on the 9th. The mean temperature for the month was 53°, or 9° above the average for 34 years. There were 2.39 inches of rain and a trace of snow. The greatest precipitation on any one day was 0.61 on the 27th-28th. The prevailing direction of the wind was southwest, and the total movement, 9,757 miles; average hourly velocity, 13.1 miles; maximum velocity for five minutes, 31 miles per hour from the northwest on the 7th. The month had 10 clear days, 10 partly cloudy and 11 cloudy. Rain fell on 11 days.



RECORD OF THE WEATHER IN PITTSBURG FOR MARCH, 1907



RECORD OF THE WEATHER IN ST. LOUIS FOR MARCH, 1907

Upper black line indicates temperature in degrees Fahr.
Dotted line indicates relative humidity in percentage
Lower black line indicates velocity of wind in miles per hour
Arrows fly with prevailing direction of wind
S—Clear. PC—Partly Cloudy. C—Cloudy. R.—Rain. Sn.—Snow

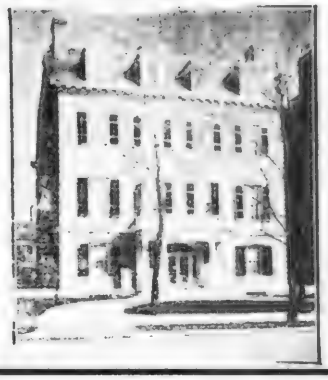
TRADE AND MISCELLANEOUS NOTES

Trade Literature.

McNab & Harlin Manufacturing Co., 50-56 John street, New York, has just issued the ninth edition of its illustrated catalogue. Special attention is called to the change in style of some of the old patterns of valves, etc., and to the increase in the variety of goods which the firm is now manufacturing, notably extra heavy iron body globe and angle valves, outside screw and yoke iron body gate valves, iron body Jenkins disk valves, stop and check valves combined, sea cocks, dye house swing joints; also to the fact that owing to the increase in steam pressures, many of the firm's patterns and machinery have been adapted to meet this condition, thus maintaining the high character and standard of the company's goods. Announcement is also made that the company's plant has been increased materially and much additional modern machinery installed. Complete stocks are carried both at the factory in Paterson, N. J., and at the warerooms, 50-56 John street, New York. The catalogue contains 284 pages. Size, 5¼x8¼ inches.

Prizer-Painter Stove & Heater Co., Reading, Pa., is sending out an interesting circular describing and illustrating the Henderson Radiant Heater for steam or hot water. Ratings are also given for the various sizes for both hard and soft coal.

H. W. Johns-Manville Co., New York, in a recently-issued circular, calls attention to the "J-M" Electric Heater, portable type, giving also the amount of current consumed by the heater at various voltages. These heaters are unusually compact and are easily portable. They are rated at $29.25 for each size.



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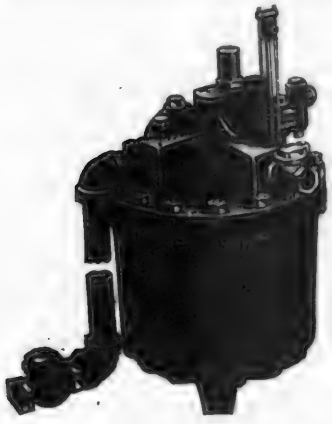

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JAMES H. BLESSING, GEN. MGR.

Business Changes.

Rossman & Bracken Co., 11 East Twenty-second street, New York, plumbing and heating contractors, who failed recently, had liabilities amounting to $137,000 and nominal assets of $172,000. The business was established in 1891 with a capital of $100,000.

Wm. J. Baldwin, Jr., lately of the Baldwin Engineering Co., New York, has established the Baldwin Heating Co., at 1181 Broadway, New York.

Manufacturers' Notes

Utica Pipe Foundry Co., Utica, N. Y., suffered the loss of its foundry, No. 1, in a fire March 12. The insurance will fully cover the loss.

Vacuum-Vapor Co., Moline, Ill., has altered its name to the Moline Vacuum Heating Company. Mr. H. W. Nelson, of the Moline Heating and Construction Co., has purchased the capital stock of the Vacuum-Vapor Co.

Kellogg-Mackay-Cameron Co., Chicago, has removed the patterns and stock of W. F. Swadkins, recently purchased at foreclosure sale, to its warehouse at Eighteenth street, near Canal street, Chicago, where orders for this stock will be filled.

American Steam Pump Co., Battle Creek, Mich., has almost completed a new machine shop, 80x220 feet and two stories high.

Bruce & Cook, 186-188 Water street, New York, have admitted August C. Pieper to partnership in the firm.

National Tube Co., Pittsburg, Pa., is planning to place in operation its plant at Youngstown, Ohio, which has been idle for a year past.

Morrison & Kretschner Mfg. Co., Dubuque, Ia., is the name of a new firm composed of Andrew Morrison, F. N. Kretschner and H. C. Kretschner. The firm will engage in the manufacture of plumbing supplies.

Mackay Manufacturing Co., 113 Beekman street, New York, has set up its new sign, covering the front of the second floor of the building. The company, under the management of William M. Mackay, is preparing for the spring trade with an unusually full line of boilers and radiators, to be known as the Manhattan line and combining many new features in boiler and radiator construction.

Jacob C. Schaeffler, of Boston, Mass., has taken charge of the New York office of the Donnelly Positive Differential System of Steam Circulation, at 132 Nassau street, New York, Mr. James B. Donnelly having arranged to devote his time in the future to consulting work.

Ashton Valve Co., Boston, Mass., is arranging to build a new plant at Cambridge, Mass. The building will be 60x200 feet in area, and five stories high. The machinery in the present plant will be removed to the new building.

Harrisburg Pipe and Pipe Bending Co., Harrisburg, Pa., is arranging to replace its present buildings, which were recently injured by fire and temporarily repaired, by a new steel structure to cover about one acre. The new building is to be completed during the summer.

National Tube Co., Pittsburg, Pa., established a world's record March 8 last, in its total output of finished pipe at all the plants of the company. The figures were 5,850 gross tons. At the McKeesport plant the total output on that date was 2,427 gross tons, the best previous record being 1,830 gross tons.

Crane Co., Chicago, will build a six-story warehouse at Dallas, Texas, to cost between $65,000 and $90,000.

Bridgman Brothers Co., Philadelphia, is building an addition to its plant at Fifteenth street and Washington avenue, Philadelphia. The addition will be 90x100 feet, five stories high, built of reinforced concrete.

THE SCHOOL HOUSE, ITS HEATING AND VENTILATION

By JOSEPH A. MOORE, *Inspector of Public Buildings, State of Massachusetts*

The author having been for the last eighteen years engaged in the inspection of public buildings in Massachusetts, and in supervising the construction of and testing the various methods of heating and ventilation, especially in school houses, presents to those interested in our public schools some suggestions as to the construction and the heating and ventilation of such buildings. The class of buildings selected are those of small or moderate size, of which many are erected each year.

The author does not attempt to give theoretical or scientific descriptions or arguments, but simply such methods and plans as have been proved by actual experience to give satisfactory results.

Many of the plans were designed by the author for the annual official reports of the late Rufus R. Wade, chief of the Massachusetts district police.

The method of setting up indirect radiators, as shown in the plans and now generally adopted in Massachusetts, was designed by Mr. Moore, and first published in drawings which formed part of the official exhibit of the inspection department of the Massachusetts district police at the Columbian Exposition at Chicago in 1893, and for which an award was given.

Other plans formed part of the exhibit at the Paris Exposition in 1900, for which an award was also given, and at the Louisiana Purchase Exposition at St. Louis. **204 pages, illustrated. Price, $2.00**

Address **The Heating and Ventilating Magazine,** 1123 Broadway, New York

Gurney Heater Manufacturing Co., Boston, Mass., announces the removal of its New York Office to 12 East Forty-second street.

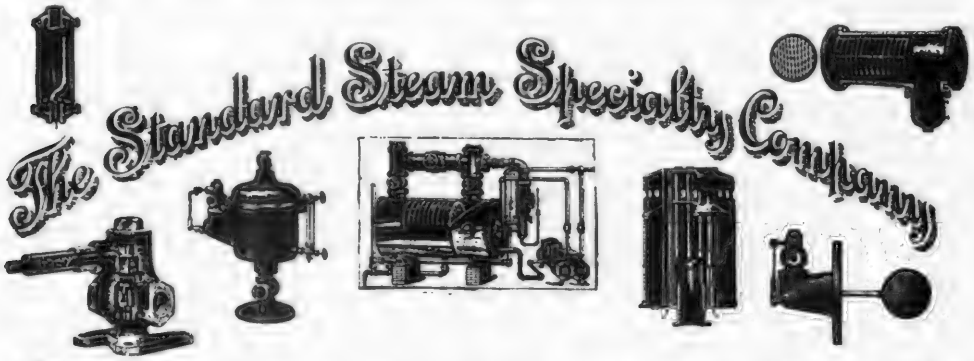
McCrum-Howell Co., New York, is making extensive improvements in its plant at Norwich, Conn., to provide suitable equipment for the manufacture of a new and full line of round and sectional boilers, which the company is about to place on the market. The improvements will give the foundry a capacity of twenty-one tons per hour. Additional track facilities will also be provided.

D. T. Williams Valve Co., Cincinnati, O., has completed its new building, which it will occupy shortly.

Aird-Don Company, Troy, N. Y., and the Colwell Lead Co., New York, are among the firms who have recently added to their stock an equipment of luminous and non-luminous electric radiators, in response to a growing demand for this class of goods.

American Radiator Company held its annual meeting March 6, at East Orange, N. J. The retiring directors were reelected. The present officers and directors of the company are: President, Clarence M. Woolley; vice-president, John B. Pierce; second vice-president, Charles H. Hodges; treasurer, Charles M. Parker; directors: Henry Bond, Clarence Carpenter, James B. Dill, Ralph M. Dyer, John Fertig, James B. Forgan, Charles H. Hodges, Frank O. Lowden, J. L. McKinney, George W. Parker, Frank M. Peters, J. B. Pierce, Walter Russell and Clarence M. Woolley. The president's report showed the fiscal year, ending January 31, to have been an exceptionally profitable one. In addition to large gains in net profits and surplus, the company earned 13.08 per cent. on its $5,000,000 of common stock. The business has expanded in many directions, resulting in the establishment of new branches, with warehouse facilities. It was announced that the company has reserved an insurance fund for protection against a decline in the value of its finished products. A guaranty fund has also been established for bad accounts, both accounts having been deducted from the earnings. The net profits for the year were $864,281 an increase of $30,364 over the previous year. The balance after deductions for dividends, amounted to $654,281. There was also a gain in the company's surplus over that for last year of $26,377, the figures being $454,281 for 1906, making the company's total surplus, $3,384,072.

Holland Radiator Co., Chicago, Ill., has opened a New York sales office at 160 Fifth avenue.



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542-544 WEST BROADWAY, NEW YORK

Erie Heating Co., Chicago, will move its plant to Aurora, Ill., where it will build a new plant for the manufacture of heating apparatus.

International Heater Co., Utica, N. Y., held its annual meeting at the company's offices in Utica, March 19. The following were elected directors: F. E. Wheeler, F. H. Moore, J. F. Maynard, C. S. Symonds, H. R. Williams, E. J. Millspaugh, William T. Baker. At the directors' meeting the following officers were elected: President, F. E. Wheeler; vice-president, H. R. Williams; treasurer, F. H. Moore; secretary, W. E. Hopkins; executive committee, C. S. Symonds, E. J. Millspaugh and W. T. Baker.

Garwood Foundry and Machine Co., Garwood, N. J., has completed arrangements with the Thos. F. Cushing Co., of New York, to act as its New York sales managers. A branch office will be opened May 1 at 40 East 21st street, where a complete line of Bernhard boilers will be on exhibition.

J. O'Meara (Inc.), 141 Centre street, New York, has made an arrangement with the Ohio Brass Co., of Mansfield, Ohio, whereby the latter will adopt the O'Meara patented valve wheel on certain of their valves. The feature of this wheel is that it is placed on the spindle without a top or bottom plate, nuts or screws, thus preventing burning the hand in opening or closing the valve.

McCrum-Howell Co., New York, has made a deal with one of the leading export houses whereby the firm will have representation in Japan. A large order for Richmond boilers and Uniontown radiators is now being assembled for shipment to the Orient.

McCrum-Howell Co., New York, announces under date of April 6, 1907, that owing to the increased cost of production, all prices on Richmond boilers, tank heaters and laundry stoves are withdrawn. New price lists and discounts will be issued shortly.

American Radiator Co., Chicago, Ill., advises us that in a single issue of the popular magazines, in which its advertisement appears, the number of copies printed is 9,530,000, claiming a total of 49,650,000 readers. The enormous effect of this advertising in creating a demand for steam and hot water heating apparatus, and, in consequence, upbuilding the business of everyone engaged in this industry, especially the contractor, makes the company's campaign one of national importance to the trade.

Zinc-Coated Steel Slip Nipples

For Steam and Hot Water Radiators and House Heating Boilers

THE PRATT CHUCK CO., Frankfort, N.Y.

FREE SAMPLES furnished to interested parties

Miscellaneous Notes

Allen N. McNab, receiver of the Niagara Radiator Co., North Tonawanda, N. Y., in a recently issued statement, announces that it has been found impossible to continue the business indefinitely under the management of the receiver on account of the many orders and contracts submitted for acceptance and requiring deliveries extending over a period of one year. Acting upon this statement the advisory committee has decided to sell the plant, the business being continued only until such sale can be made. A meeting of the creditors of the company was held at Lockport, N. Y., March 9, to appoint a trustee and fix a date of sale.

John Collis, Des Moines, Ia., one of the old-time steam fitters of New York, who went to Iowa thirty years ago where he built up a successful contracting business, is in the East again with a number of his inventions which he expects to place on the market. One of his interesting devices is a vacuum valve for radiators constructed entirely without packing.

New York Trade School, Sixty-seventh street and First avenue, New York, held its commencement exercises April 3. An exhibition of the work of the various classes was open for inspection the evening previous to the commencement, and included many specimens of the work done by the class in steam and hot water fitting.

John D. Hibbard, president of the John Davis Co., Chicago, Ill., left New York, Saturday, March 9, for a trip to the West Indies, sailing on the steamer Cecilia. While in New York, Mr. Hibbard, who is chairman of the National Committee of the Confederated Supply Association, conferred with other members of the committee upon association matters.

Alton Gas & Electric Co., St. Louis, Mo., after operating a central heating plant for eight years in Alton, may abandon its system owing to the fact that it has become necessary to move the company's mains on Third street. The system is said to have been unprofitable. It is at present supplying heat to many churches, schoolhouses, the city building, residences and business houses.

Lorain Heater & Supply Co., Norwalk, Ohio, has been served with a petition in bankruptcy and T. J. Barrows has been appointed receiver.

Sodemann Co., St. Louis, heating West End School at Little Rock, Ark., for $3,487.

BOOKS ON HEATING AND VENTILATING

Heating and Ventilating Buildings

By ROLLA C. CARPENTER. Fourth Edition. Largely rewritten. 577 Pages. 277 Figures. Size, 6x9 inches. Cloth, $4.00.

A standard manual for heating engineers and architects. Includes chapters on exhaust steam heating and heating with electricity.

Baldwin on Heating; or, Steam Heating for Buildings (Revised).

By WILLIAM J. BALDWIN. Fifteenth Edition. Revised and Enlarged, 391 Pages. 131 Figures. Size, 5x7½ inches. Cloth, $2 50.

Contains descriptions of steam heating apparatus for warming and ventilating large buildings and private houses, with remarks and tables.

Questions and Answers on the Theory and Practice of Steam and Hot Water Heating

By R. M. STARBUCK 90 Pages. Pocket size. Illustrated. Cloth, $1.00.

A handy book for the steam fitter, containing tables and data, rules, and "tricks of the trade."

Mechanics of Ventilation

By GEORGE W. RAFTER. Pocket size. Boards, 50c. New and revised edition.

Modern Sanitary Plumbing, Steam and Hot Water Heating

By JAMES J. LAWLER. 400 Pages. 288 Illustrations. Size, 6x9 inches Price, $5.00.

This is the latest edition of Mr. Lawler's well known work on this subject.

Notes on Heating and Ventilation

By JOHN R. ALLEN. 152 Pages. 34 Illustrations. Size, 4½x6½ inches. Cloth, $2.00.

One of the new books, brought quite up to date, and containing much information to guide the intelligent steam fitter in the installation of heating and ventilating apparatus.

Ventilation of Buildings

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Just out. Contains a statement of the general principles of ventilation and of their application to different kinds of buildings.

Chimneys for Furnaces and Steam Boilers

By R. Armstrong. Pocket size. Boards, 50c.

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1123 Broadway, New York

Contracts Awarded

Robert W. Kyle Company, Wheeling, W. Va., heating and plumbing residence of J. D. Merriman at Wheeling.

Fitzpatrick & Hoefner, Columbus, O., steam heating $100,000 business and apartment building at Columbus for Frederick W. Schumacker.

Johnstown Supply House, Johnstown, Pa., heating and plumbing $10,000 residence for Mrs. Elsie Croyle at Johnstown.

Schell Hardware Co., Somerset, Pa., heating and plumbing J. B. Winter office building on Main street, Somerset.

McGinness-Smith Co., Pittsburg, Pa., heating and ventilating school at South Cannonsburg, Pa. The building will cost $100,000.

F. A. Fite Co., Pittsburg, Pa., furnace heating system for J. J. Rungee's apartment building at St. Clair.

John G. Sutton & Co., San Francisco, Cal., steam heating plant in new six-story brick building being built by East Street Improvement Company. The plant will cost $3,250.

Andrews Heating Co., Chicago, Ill., heating and plumbing new East Side Police Station in Minneapolis.

A. J. Potts, St. Peter, Minn., heating and plumbing new High School building at St. Peter.

Wm. M. Claney Plumbing and Heating Co., St. Louis, Mo., heating and ventilating the Baden School at St. Louis.

Bradlee & Chatman, Boston, Mass., heating Massachusetts Mutual Insurance Company's office building at Springfield, Mass.

Baker, Smith & Co., Pittsburg, Pa., heating new automobile garage on Beatty street, Pittsburg.

Fred. Hayes, Bristol, Tenn., heating and plumbing new Y. M. C. A. building at Fifth and Shelby streets, Bristol.

Downey & Kruse Co., Milwaukee, Wis., heating new City Hall at Watertown, Wis.

G. H. Sutherland, Walla Walla, Wash., heating new City Hall at that place.

Bower Bros & Co., heating new terminal station of the Philadelphia and Garretsford Street Railway Co., at Upper Darby.

Tunstead Heating Co., Minneapolis, Minn., heating the new Columbus School.

George E. Haslam Co., Providence, R. I., heating new seminary of the Convent of Mercy at Bay View, East Providence.

N. Treis Heating Co., Milwaukee, Wis., heating plant for House of Correction at Milwaukee. The firm's bid was $1,656.

Pond & Hasey Co., Milwaukee, Wis., heating the Pillsbury School.

Archambo Heating Co., Minneapolis, Minn., heating new Simmons School.

Spriggs Bros., Grand Forks, Minn., heating plant for the Hamm Brewing Company's new building at East Grand Forks.

Mowner Plumbing Co., Orrville, O., hot water heating system for a number of greenhouses for M. S. Yoder.

George Stone, Altoona, Pa., heating contract for the residence of O. E. Wyckhoff at Grafton, W. Va.

Monitor Steam Generator and Mfg. Co., Lancaster Pa., steam heating Germania Brewing Company's hotel at Altoona.

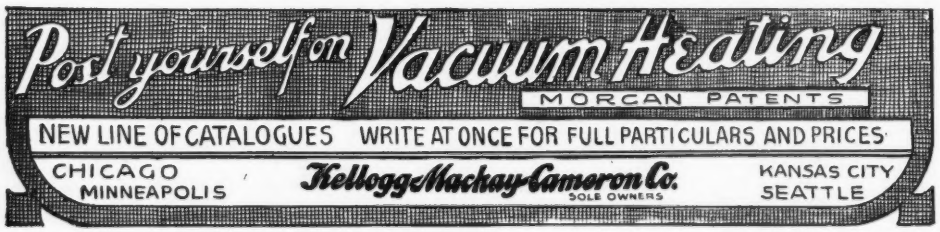
Hess & Rau, Watertown, S. D., heating new school building at Lisseton, S. D.

Samuel Faith & Co., Philadelphia, Pa., heating building at 919 Walnut street, Philadelphia. The contract calls for 16,000 square feet of radiation.

E. D. Hornbrook, Kansas City, Mo., heating, ventilating and plumbing new fifteen-story building for National Bank of Commerce. The contract figure is over $100,000.

Robert T. Shaw, Streator, Ill., heating and plumbing new building for People's Trust and Savings Bank; also heating and plumbing new residence for Mrs. N. L. Arthur.

H. Kelly & Co., Minneapolis, Minn., heating and plumbing new High School at Elbow Lake, Minn.



Business Chances

Monmouth, Ill.—The proposition of a large central heating plant for the buildings of Monmouth College is engaging the authorities of the institution, and the prospects are that if there is any way by which such a plant can be built, it will be installed during the coming summer. Such a plant would cost about $6,000. At present each building has a separate heating plant.

Lincoln, Neb.—A bill has been introduced in the Nebraska legislature appropriating $25,000 for a heating plant at the State Normal School at Peru. The sponsor of the bill is Mr. Armstrong, of Nemaha.

Faribault, Minn.—A committee of vestrymen of the Cathedral parish are soliciting funds for a new heating plant for the Cathedral. It is also planned to install a ventilating system, the whole to cost about $2,000.

Leavenworth, Kan.—A new heating plant will be installed shortly in the buildings within the prison walls, the present plant having been found to be too old and defective.

Rochester, Minn.—The Commercial Club has launched a plan for a central heating plant which will heat the entire business district of the city.

Columbus, Ohio.—Architects Dawson & Holbrook are preparing plans for a new plumbing, heating and mechanical ventilation equipment for the Court House. The changes will cost about $6 000. The plans were to be ready for figures by April 1.

Madison, Wis.—A bill in connection with the proposed new capitol building which passed the State Senate March 12 and went back to the Assembly for concurrence provides, among other things, for the erection of a separate building for a heating plant to be located outside the capitol grounds.

St. Louis, Mo.—Council Bill No. 354 is a proposed ordinance authorizing the Board of Public Improvements to install the heating apparatus in the public bathhouse on Tenth street, between Carr and Biddle streets, and providing for the cost thereof.

St. Paul, Minn.—Plans for the installation of new heating plants and plumbing at some of the public schools were approved by the school board March 6. The plans represent an expenditure of $15,000. The heating plants provided will be installed in the Cleveland, Adams, and Neill Schools.

Washington, D. C. Sealed proposals will be received at the office of the Supervising Architect, Treasury Depart-

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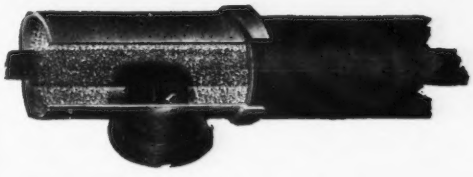

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ment, until 3 P. M., May 7, 1907, for the construction, including plumbing, heating apparatus and electric work, of an extension to the U. S. Post Office at Lafayette, Ind.

Washington, D. C.—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, until 3 P. M., May 6, 1907, for the construction (including heating apparatus, electric wiring and conduits) of the extension to the U. S. Post Office and Court House at Trenton, N. J.

A. E. Werkhoff, Lafayette, Ind., has succeeded to the business of Overesch & Werkhoff.

Heaps & Schmidt, Kewanee, Ill., heating and plumbing contractors, have dissolved partnership. The business has been purchased by C. R. Chambers, who will continue it at the same location.

For Sale

ANYONE desiring to take up a course of heating, ventilating and plumbing or mechanical drawing at one of the foremost correspondence schools in the country may secure the course at a special rate by addressing R. E., care of THE HEATING AND VENTILATING MAGAZINE.

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Mechanical engineer, technical graduate, desires position of responsibility with consulting engineer or contractor engaged in heating, ventilating and general mechanical equipment. Thoroughly competent in designing, estimating and managing work in this line. Address POWER, care of THE HEATING AND VENTILATING MAGAZINE.

Position wanted, by a practical heating and ventilating engineer, with a leading firm of architects or contractors. Thoroughly competent on all systems, high- or low-pressure work, a good draughtsman and careful estimator. Address A. B., care of THE HEATING AND VENTILATING MAGAZINE.

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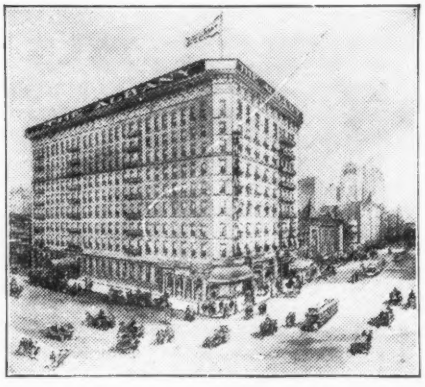

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